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THE
PRACTICE
OF
SURGERY

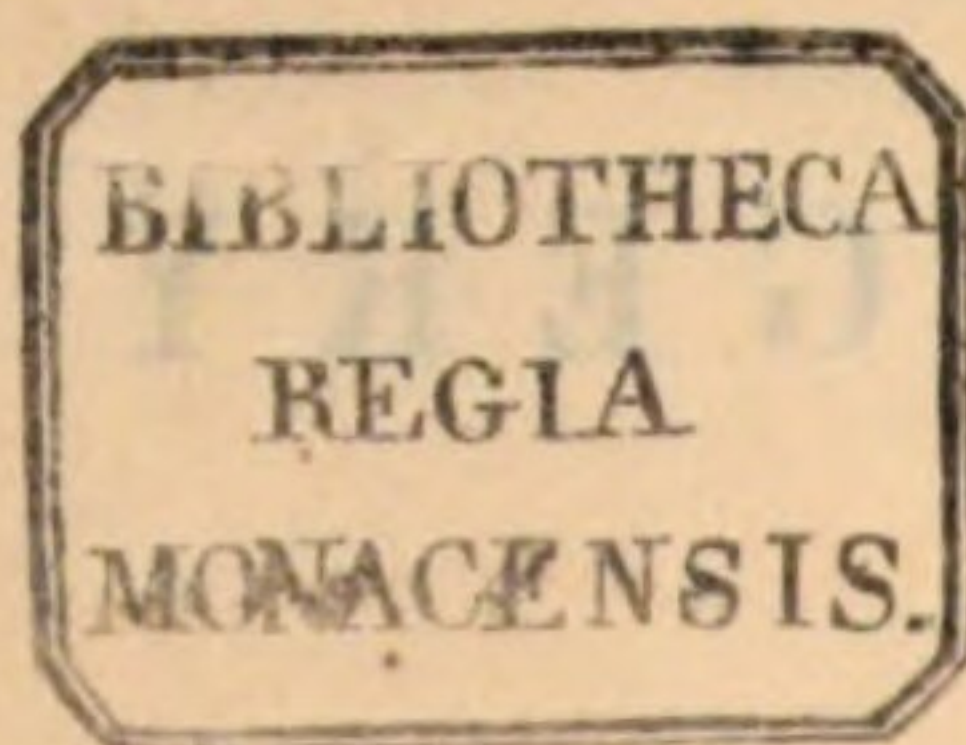
BY

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TO

ROBERT LISTON,

THIS VOLUME, LIKE THE FORMER,

IS DEDICATED ;

IN TOKEN OF

SINCERE PERSONAL AND PROFESSIONAL

REGARD.

P R E F A C E.

THIS Volume is not put forth in rivalry of the excellent works on Practical Surgery which already exist; but as a Companion to the "Principles of Surgery," lately published. It is intended to exhibit the application of these Principles to the details of injury and disease; and has been undertaken by the Author at the request of his pupils—to whom the two Volumes are now respectfully offered as a complete Text-Book of Surgery.

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ERRATUM.

At page 416, ninth line from the bottom, *for* "which forms a cloud in the urine, on cooling—dissolved by heat;" *read* "which forms a cloud in the urine—not dissolved by heat."

THE PRACTICE OF SURGERY.

CHAPTER I.

OPERATIONS.

It is a favourite phrase by which operations are stigmatized as the "opprobria of surgery." Nothing can be more unjust. To be able safely and expeditiously to remove parts which accident has rendered totally useless, and which would prove highly injurious if longer attached to the body ; to take away diseased formations, or other noxious substances, and, at the expense of but brief suffering, to dispel torture which had rendered existence a burden for previous weeks, months, and years ; to accomplish such results, though it be by blood and pain, is alike creditable to the operator and beneficial to the sufferer. It is not to operate—but to operate unseasonably, unnecessarily, unskilfully—that can ever bring disgrace ; and to refrain from performing an operation when it is loudly and plainly called for, would carry not only opprobrium to surgery, but guilt and shame to the surgeon. In former times, operations were the disgrace of our art. Knives, hot irons, screws, files, and saws, were employed with cruel and ignorant recklessness. Of late years, however, it has been the object of each truly good surgeon to simplify and diminish the number of instruments,

and at the same time to use them as seldom as possible. He does not hesitate to employ them, when his knowledge and experience tell him they have become indispensable. On the contrary, he will probably be urgent in their application, knowing that an early wound may save much after-suffering ; though, in the first place, he will exert all his skill and all his powers, by milder measures to counteract injury and restrain disease, so as to supersede the necessity of operating. To effect this, is doubtless the true triumph of his profession ; and to this triumph he often attains. But he must be Utopian indeed who can seriously hope that the period will ever arrive, when operations shall have altogether ceased to be required. Modern surgery, accordingly, while anxious to limit the necessities for operation, is not the less aware of its importance as a means of cure ; and has not only directed attention towards its improvement, but also extended its application, and with the happiest result, to diseases formerly unopposed. Many patients, for example, are now by the knife freed from morbid growths and natural deficiencies, who were formerly left an unprotected prey to deformity and disease.

A prominent cause of modern improvement in the art of operating, is an increased simplicity of the instruments, their arrangement, and use. On this subject, one who is pre-eminently distinguished among the operators of the present day, observes : * “ Our armamentaria should contain simple and efficient instruments only ; the springs, grooves, notches, and curves, seeming to be chiefly intended to compensate for want of tact and manual dexterity. The apparatus, though simple, ought to be in good order, and should always be placed within easy and convenient reach of the operator, so that he may be in a great measure independent of the lookers-on, who, owing to anxiety or curiosity, hurry and agitation, are apt to hand any thing but what may at the instant be required. He will consider well what place he himself may most conveniently occupy during the operation ; and, having obtained proper assistants, he will make sure that they all understand what is expected of them. In short, before he ventures to begin, he will ascertain that every thing is arranged, and in proper

* LISTON'S *Operative Surgery*.

order ; more particularly, that the cutting instruments have good points, that their edges are keen, and that the joints of forceps and scissors move freely and readily. The principle, too, on which the instrument is made to cut should be well considered. Every knife is to be looked upon as a fine saw ; the teeth of some are set forwards, and these cut best from point to heel, as does a razor ; but the greater number are set in the opposite direction—for example, the common scalpel and bistoury—and act efficiently only in being drawn from heel to point.

“ The skin, and in many instances the subjacent parts, should be divided at once and completely, by a single incision made lightly and rapidly—the parts being placed in a state of tension, by the fingers of the surgeon or of an assistant—for the pain experienced is in proportion to the pressure and tardiness of movement in the instrument applied. Partial division of the skin, in tails left at each end of an incision, is also to be avoided ; for the pain of such a cut is unnecessarily severe ; and, besides, such wounds are not so available, as they would otherwise be, for the intended purpose of evacuating fluid, for permitting the extraction of foreign bodies, or for the dissection of morbid growths. Also, the pausing of a surgeon in the midst of a dissection, and the resort to fresh and more extensive incisions of the surface, is not only always awkward, but attended with additional and unnecessary pain to the patient. Every cutting instrument should be well balanced, and placed in a steady, smooth handle ; the point should either be in a line with the back, which ought then to be perfectly straight, or both edge and back should be equally convex, with the point corresponding to the middle of the blade.

“ The form and size of the instrument ought always to be in proportion to the extent of the proposed incisions, as regards both their length and their depth : nothing can be imagined more cruel and reprehensible, for example, than an attempt to remove the lower extremity of a full grown person with a common scalpel or dissecting knife. If an extensive incision is necessary, an instrument should be employed possessing length of edge sufficient to separate the parts smoothly and quickly. Should the operator, on the contrary

be required to cut on important parts—to perform a delicate dissection of the living tissues—he will choose a short-bladed instrument, with a handle rather long and well rounded; and, after the superficial incisions have been effected, he will hold it as he would a writing pen, lightly but firmly, so that he can turn the edge, and cut either towards or from himself, as occasion may require. A small well-made scalpel, with a good point, and less convexity than those usually employed, is the instrument best adapted for such a purpose. Grooved probes and directors should be used as little as possible. With a little practice, incisions may be made upon the most delicate parts, without risk; one layer being cut after the other. And if any instrument is wanted to make the proceeding more safe—if the closely investing fasciæ of a hernial tumour, for example, are to be cautiously raised—dissecting forceps will be found the most convenient instrument for elevation previous to incision.

“In dividing the skin, the knife, whether a scalpel or a bistoury, is to be held and entered with the point and blade at right angles to the surface. It is carried with a decided movement down to the subcutaneous cellular tissue; the blade is then inclined towards the part to be divided, and by a rapid and slightly sawing motion—as little pressure being applied as possible—division is effected to the desired extent. The incision is finished by withdrawing the knife in a position perpendicular to the surface, so as to divide the entire thickness of the skin, at the extremity as well as at the origin of the wound. For dexterously effecting such manipulations, the fingers must be educated; and diligent practice in the dissecting-room will be found the best foundation for surgical dexterity, as it is for sound surgical knowledge: it is only when we have acquired dexterity on the dead subject, that we can be justified in interfering with the living.” By practice, the pupil will be enabled to use either hand almost equally well—and none should neglect to attain this power; for an ambidextrous surgeon possesses a great advantage as an operator.

An ordinary degree of expertness is within the reach of any one who will industriously seek for and improve the opportunities for its acquirement; but yet a certain combina-

tion of natural qualifications is undoubtedly necessary to the attainment of pre-eminence in operative surgery ; for a great operator in one respect resembles a great poet,—“*nascitur, non fit.*” The importance of these natural gifts did not escape Celsus. “He must be young, or at most but middle-aged,” says he, “and have a strong steady hand, never subject to tremble. He must be ambidextrous, and of a quick, clear sight. He must be bold, and so far void of pity that he may have in view only the cure of him whom he has taken in hand, and not, in compassion to cries, either make more haste than the case requires, or cut less than is necessary, but do all as if he were not moved by the shrieks of his patient.” The coolness and courage thus inculcated are among the most valuable natural gifts of the surgeon ; and it would be well did every patient remember that they are equally important in himself, for on his steadiness and patience under suffering much of the celerity and success of an operation depends.

The necessity for an operation, in any case, having been clearly established, our object is to perform it as safely and expeditiously as possible. The mere absence of protracted pain confers a most important advantage on the reparative powers of the system ; and, so far, celerity is commendable. But it is a very common as well as dangerous error to suppose, that the excellence is always commensurate with the rapidity of performance. In the great majority of cases, haste is incompatible with safety ; while the latter is the paramount object in view. “*Tuto et celeriter*” is the operator’s motto ; but the “*tuto*” precedes its accompaniment. It is doubtless a great matter, that when we are compelled to inflict pain, the amount and duration of that necessary evil should be as limited as possible ; but it will prove a blind cure which purchases a moment’s ease at the expense of life’s hazard, or at the cost of weeks and months of protracted suffering. The student, as an operator, should learn to be rapid ; but rapid, because skilful ; and rapid only when safe. And, in some procedures, he will not fail to learn that attempted rapidity must ever prove injurious.

Perhaps a more common, and still more serious error is—the imagining that operations constitute the greater and more important part of Practical Surgery. The student is very

apt to be led away by the more garish and imposing parts of his profession, to the neglect of that which is in truth by much the more valuable ; and he may also forget that, in after life, he will be only occasionally called upon to perform the greater operations, while daily he must exert his general knowledge and skill, as well as his minor handicraft, to avert the necessity for use of the knife and other maiming weapons. In the case of a diseased joint, for example, placed under his care, he is not at once to feel the edge of his knife, and contemplate amputation or resection. Such procedure is the ultimatum, not the initiative of his art. Local depletion, rest of the part, counter irritation duly timed and conducted, pressure, splints, attention to the general health, these—to some, apparently a simpler, but in truth a far higher adaptation of knowledge—conspire, and often with success, not to mutilate the frame and endanger life, but to save both life and limb, at but little cost of either pain or danger. Again, in the torturing complaint of stone in the bladder, it is doubtless a great matter to be able by a speedy operation—severe, and perilous to life though it be—to free the patient from his misery. And the accomplished surgeon must be at all times competent to undertake fearlessly this hazardous procedure. But it is surely a higher exercise of a better skill, and both the means and the result will prove infinitely more creditable and satisfactory, if, by the internal use of simple remedies, and suitable attention to hygiene, the disease shall be in its very origin frustrated, pain and danger dispelled, and health and comfort restored—all without the infliction of a scratch, or the loss of one drop of blood. In the case of injury, too, the paramount importance of general treatment will be found equally to obtain. The surgeon is ready, at a moment's warning, to amputate skilfully a crushed limb, which has obviously no chance of retaining its vitality, and which, if not speedily removed, must inevitably peril the whole frame's existence ; and when, by such severe operation, he succeeds in averting the greater calamity, he has most just ground for self-gratulation, and may truly say that a good thing has been done by his art for suffering humanity. But when, in the case of an injury a shade less severe, there is a doubt whether or not the limb may be enabled to resist the threatened gan-

grene, when he hesitates not to give to his patient the benefit of that doubt; when, by great patience, care, and skill, he arranges the mangled fragments in their proper place, retains them so by suitable apparatus, affording due support, and yet permitting no undue pressure, regulating the play of the general circulation, controlling the efforts of the *vis vitæ*—in short, averting both local and general disaster, and bringing the healthful action of reparation to complete, though it may be slowly, its valued process of cure; and when ultimately a thorough and permanent success crowns such patient and anxious labours:—surely the cause for self-gratulation is increased a hundred fold; the surgeon may well say that a far better thing has been done by his art; and the discerning public will not fail to award to him a higher and a truer meed of praise.

The advance of surgery will ever be found characterized by a corresponding decrease in its operations, both in amount and in severity. The true object of our mission is not to cut, but to cure.

The *Principles* of Surgery—common alike to that art and to medicine—we have formerly considered. The adapting of these to individual examples of disease, constitutes the *Practice* of Surgery; and that is the subject which the following pages are intended to expound.

CHAPTER II.

INJURIES OF THE SCALP.

Bruise of the Scalp.

THE scalp is especially liable to severity of contusion. It is a part very much exposed to external injury; it is stretched over dense resisting bone; it is possessed of very considerable vascularity; and its arterial branches, being neither inactive nor minute, are apt to part with blood freely when torn. Hence, when external violence is applied, the higher results of contusion are very apt to follow. Continuity

may be broken in the texture ; giving a contused wound, of greater or less extent, whose margins will slough and separate, and which will not heal without considerable suppuration, and a corresponding amount of attendant inflammatory process. Or, the integuments, at first remaining entire, may slough to a greater or less extent ; either immediately, from the direct effect of violent contusion ; or secondarily, by inflammatory action induced in a part whose vitality had been only lowered by the bruise, not annihilated. Or, the integuments remaining entire, blood is copiously extravasated from ruptured vessels ; breaking up the cellular tissue, and producing a large fluctuating tumour—sometimes forming rapidly, with tension of the skin, and much pain in the part. Or, subsequently to sanguineous infiltration, inflammatory action may be lighted up in the implicated texture ; inducing suppuration of an unhealthy kind, with a considerable amount of constitutional disturbance, and with a risk of the latter being unfavourably affected by the suppuration assuming the asthenic and consequently a diffuse and infiltrating character. The danger of such occurrences must be remembered in the prognosis.

But the ordinary result of bruise, in this locality, is the formation of a bloody tumour ; blood escaping more or less freely from torn vessels, and accumulating in the part ; while room is made for its reception, partly by disruption of texture, partly by that which remains entire being pushed aside and condensed. As already stated, the integument is tense or not, according to the rapidity and amount of extravasation. At first, the indications by the touch are uniform throughout the whole swelling, all the blood being as yet fluid ; uniform fluctuation is more or less distinct, with elasticity. Soon, however, the blood in part assumes the solid form ; and then the characters of the tumour change. Circumferentially, there is a hard, resisting ring, more or less elevated, composed of coagulum. Centrally, the part is soft, yielding, fluctuating ; the blood there remaining fluid, consisting chiefly of serum, and situated immediately beneath the integument. The clot occupies the margins. At this period, care is required in examination, lest a false diagnosis be arrived at. The finger, placed firmly on the centre, readily displaces the serous fluid,

and may seem to penetrate to some depth ; while similar pressure, made at the margins, meets with hard, unyielding resistance—and that at a considerably higher level than had just been passed by the finger in pursuit of the retreating serum. The careless observer of such things is apt to imagine them an undoubted indication of fracture, with depression, having occurred in the cranium ; the hard ring is thought to be the bone in its normal position, with an abrupt broken margin, beneath which a detached portion has been driven. Attention to three or four circumstances, however, will suffice to undeceive. The symptoms of depressed cranium do not exist. Press firmly on the soft and yielding centre ; the subjacent bone will be reached, by displacement of the intervening fluid blood, and will be found firm. The hard rim of the swelling will be found on a higher level than the calvarium ; and, besides, by a little firmness of manipulation, if such be deemed necessary, it can be displaced somewhat, disclosing firm bone beneath.

The treatment of such a bruise is conducted on the principles generally applicable to this description of injury, (*Principles*, p. 710.) In certain situations—as, directly over known branches of the temporal or occipital arteries—swelling may be in a great measure prevented, by moderate pressure being steadily maintained on the cardiac aspect of the implicated vessel ; and this indication may be further fulfilled, by continuous application of cold to the part, and its immediate vicinity. When the tumour has formed, even tension will not warrant either puncture or incision ; for the admission of atmospheric influence to the extravasated blood and infiltrated tissue is very likely to induce an inflammatory action under very unfavourable circumstances. By fomentation rather—associated, if need be, with restraining pressure on the arterial branch—let accommodation be obtained for the escaped fluid by yielding of the recipient texture ; ward off inflammatory action by general antiphlogistics ; and await the disappearance of swelling, gradual and tedious though it be, by the natural action of the absorbents. The fluid portion of the extravasation is taken up first ; the coagulum follows, more tardily.

But if inflammatory action shall have occurred, and sup-

puration formed, incision, free and direct, must not be withheld. By no other means can diffuse suppuration be prevented, and constitutional involvement be checked. At once lay the part freely open ; turn out the coagulum, and permit all fluids to escape. An unhealthy abscess remains for a time, but duly changes, contracts, and heals ; and the knife is not again required. But, delay incision ; and then the knife is called for, not merely in the bruised part, but in the parts adjacent, now the seat of a spreading asthenic inflammation, and in imminent danger of perishing thereby. The asthenic tendency, as formerly hinted, is probably owing to the bruise having lowered the vitality of the parts ; so impairing their tolerance of inflammatory accession.

The constitutional management is not to be neglected. It is obviously of great importance to avert, or at least to moderate, the accession of an inflammatory process in the injured part. On this ground alone, rest and quietude, antiphlogistic regimen, and perhaps depletion, are expedient. But the necessity for recourse to such precautions becomes still more apparent, when it is remembered that the brain, in all cases of severe bruise of the scalp, must have suffered more or less by concussion, and has to be protected from the consequences.

When all risk of inflammatory accession has passed, and the swelling has not yet disappeared, absorption may be hastened by discutient measures. The part may be kept wet with a solution of the muriate of ammonia ; afterwards friction may be used, and, if need be, pressure.

Bloody tumours, of the foregoing nature, not unfrequently form on the heads of children, newly born, who have sustained injury of the scalp during the process of parturition. But such cases scarcely come within the province of the surgeon.

Wounds of the Scalp.

Simple incised wounds of the scalp are apt to prove troublesome by bleeding. The arterial point or points are to be exposed, and secured by ligature. Pressure may, in some instances, succeed ; but, in general, it is decidedly inferior to the use of ligature ; being not only less certain as a hæmostatic,

but also liable to induce sloughing, or at least a troublesome ulceration, in the compressed part. When necessary, therefore, the surgeon need not hesitate to extend the wound, to facilitate accurate deligation. When bleeding has been arrested, the wound is to be brought together, and retained in apposition ; but sutures are, if possible, to be avoided ; experience having shown that here they are especially liable to prove exciting causes of erysipelas. The subsequent treatment is such as is ordinarily adopted for the securing of adhesion. One simple precaution should never be omitted at the commencement of the treatment, namely, the shaving of the scalp, not only at the wounded part, but to some distance around. The retentive straps, and other dressings, are more readily and securely applied ; the part is more certainly kept free from irritation ; coolness is more easily maintained ; and inspection of the wound's progress is more complete.

In contused and lacerated wounds, there is the same risk of unfavourable inflammatory action as in bruise ; and this is, accordingly, to be guarded against. Very often, the wound is extensive, and irregular in form ; a portion of the scalp is detached from the subjacent bone, and hangs over, an unseemly flap. Formerly, it was the custom to cut away the pendulous portion ; it being considered incapable of reattachment. Now, it is invariably preserved, and carefully replaced. It seldom sloughs, even in part. Equally seldom will it unite at once by adhesion. It suppurates, granulates, and becomes slowly, yet firmly and satisfactorily, rejoined to the subjacent parts. When a congested and flabby state of the flap occurs, as often happens, during the suppuration, support by carefully applied bandaging is highly expedient.

Not unfrequently, the bone is very rudely denuded of all its soft investments, as in heavy falls, when the head comes violently in contact with stone. The pericranium is rubbed off, and the bone is not only wholly exposed, but roughened in its own texture. In such cases, we are not to refrain from readjusting the soft parts, in the belief that exfoliation must necessarily ensue, and that a patent condition of the wound is consequently to be desired. Many bones thus circumstanced recover entirely. They may, for a day or two, become white and dry on their mere surface, as if undergoing necrosis

there ; yet it is by no means unusual—when such necrosis is not favoured by the treatment employed—to find this dry bone revive, becoming vascular, brown, and exhalent, as before, and in due time contributing its quota to the general process of reparation. Should inflammation supervene, and advance to suppuration, either in the limited or in the diffuse form, early incision is demanded ; in the one case, to evacuate pus, and prevent accumulation ; in the other, to limit its formation, and prevent infiltration. When the cellular tissue beneath the occipito-frontalis' expansion is implicated in the latter event, incision is required to be especially early and free ; not only to avert destruction to texture, but also to prevent, or moderate, implication of the all-important cranial contents. These, indeed, must be duly regarded, throughout the whole period of treatment, just as in simple contusion.

Punctured wounds of the scalp, usually oblique and penetrating, are always important ; being very apt to be followed by severe inflammatory action ; and at an early period, and on this account, demanding incision. As a general rule, it may be stated that, in the scalp, inflammatory action must always be treated with great activity. First, because the textures are unfavourable for the safe advancement of the process ; they are vascular, tense, unyielding, fibrous ; the action is apt to be acute ; the exudation is copious and rapid, accommodation afforded by the recipient texture is insufficient, tension ensues, and, as usual, aggravation follows thereon ; suppuration is speedy, and apt to be diffuse ; and the pus tends to burrow rapidly, and in all respects destructively, beneath the fibrous structures. Secondly, the part affected is in close and dangerous proximity to the cranial contents ; and these are apt to be involved in a secondary, but not less important, inflammatory process.

Wounds of the Temporal Artery.

Arteriotomy.—Under certain circumstances it is deemed advisable to abstract blood, with a remedial object in view, from an artery, and from one situate in the upper part of the body. The anterior branch of the temporal artery is usually

selected ; being quite subcutaneous, it is of easy access ; and being also placed immediately over resisting bone, it is favourably situated for hæmostatic purposes. A suitable part of the vessel having been fixed upon, it is steadied by the fingers of the left hand, while a lancet, moved by those of the right, is made to perforate the arterial tube, in an obliquely transverse direction. The entrance and exit of the lancet are managed so as to make the wound of the integument considerably larger than that in the arterial coats ; in order that there may be no obstruction to the free escape of the blood. A section of the wound, in fact, should resemble that of a cone ; the truncated apex corresponding to the aperture in the vessel, the base to that in the integument. When a sufficiency of blood has flowed, it is well to reintroduce the lancet, and to move its point so as to effect complete section of the vessel ; in order that contraction and retraction of each orifice may take place, and natural hæmostatics may so be favoured. A graduated compress is accurately applied over the wound, and securely retained by a bandage. The dressing should not be disturbed for several days.

If blood do not escape readily enough, a cupping-glass should be applied ; care being taken to raise the rim gently over the artery on its cardiac aspect ; otherwise the pressure must inevitably arrest the flow. And this is the only mode of cupping which can be considered warrantable in this situation. Use of the ordinary scarificator leaves a very unseemly scar, especially in the female. The lancet's puncture, in arteriotomy, is, on the contrary, slight, and its scar scarcely appreciable ; and, at the same time, it is to be remembered, that from this one puncture blood will flow much more freely than from all the twelve incisions of the ordinary instrument.

In accidental wounds of the temporal artery, deligation is generally preferable to pressure, as already stated. In the case of a mere branch, it is sufficient to tie the cardiac orifice. But when the main trunk is implicated, the distal orifice must also be secured, otherwise recurrence of the hæmorrhage is almost certain.

Unpleasant consequences sometimes follow wounds of the temporal artery, whether accidental or intended. *False aneurism* may form. This, usually, has attained to but a small

size, ere the patient's attention is arrested by it, and the surgeon's aid sought. If deligation be practised at a distance, it is necessary to secure the vessel on each aspect of the tumour ; otherwise collateral circulation will prove too free for due completion of the cure ; and, on the distal aspect, the vessel is not likely to be discovered without much difficulty. In the majority of cases, it is sufficient to put in force the ordinary treatment for recent false aneurism ; to cut through the tumour, turn out the clot, and secure the vessel by ligature above and below the wounded point. In those cases to which such procedure may seem to be inapplicable, ablation of the small swelling, by two elliptical incisions, may be had recourse to ; securing each of the bleeding points in the ordinary way, and bringing the wound together for adhesion.

On removing the compress, after arteriotomy, the wound may be found to have degenerated into *ulcer*. The ulceration spreads, the vessel is opened, hæmorrhage occurs ; and, by repetition, the loss of blood becomes hazardous. Pressure, reapplied, may temporarily arrest the flow ; but necessarily favours the advance of ulceration, and so renders return of the bleeding certain, on removal or change of the dressing. It is better to abstain from pressure ; and to tie the vessel on each aspect of the sore ; either by regular dissection in the line of the vessel ; or, when swelling and condensation of texture render that difficult, by transverse wounds—securing the bleeding points by forceps in the ordinary way. Or, if the ulcer be minute, ablation of the changed part may be effected, as for false aneurism.

CHAPTER III.

INJURIES OF THE CRANIUM ; AND THEIR CONSEQUENCES.

By external violence the cranium may be shaken, fissured, or fractured with comminution. In any case, more or less injury is at the same time sustained by the cranial contents. The brain and its investing membranes may be torn, and blood may become extravasated. The inflammatory process

may be kindled, perilling life by exudation, suppuration, or chronic change of structure. Or the brain may be merely shaken, and temporarily impaired in its function.

Concussion of the Brain.

In strict acceptation, this term denotes a mere shaking of the organ ; without any appreciable læsion of structure, and consequent escape of blood, immediate or secondary. Function is impaired, often most seriously ; usually, it is after a time restored, more or less completely ; yet not without much risk of an inflammatory process intervening, in either the brain or its membranes, to modify, protract, or prevent the fortunate issue. Under the impulse of a blow or fall, the brain must sustain more or less vibration, if the cranium remain entire. It is "a pulpy organ, which exactly fills a nearly spherical bony cavity, whose parietes are elastic in a considerable though very variable degree ; and if these parietes sustain any sudden change of shape, their contents must sustain a corresponding amount of compression. As any alteration in the shape of a spherical cavity must lessen its capacity, whenever any external force impinges on the cranium with sufficient violence, it must be flattened at the point of impact, and expanded in some opposite direction ; but these changes are, in virtue of the very cause whence they originate, of but momentary duration ; the point primarily flattened by the compressing force immediately resumes its original shape, which is necessarily followed by a corresponding return of the expanded portion of the cranium to its previous dimensions. These oscillations may occur several times in rapid succession, their number and extent depending on the elasticity of the cranium, and on the amount and direction of the force applied. In concussion, then, the entire brain sustains a series of vibrations and momentary compressions, varying in number and amount in every imaginable degree in different cases."*

The injury may be applied either directly or indirectly ;

* *British and Foreign Medical Review*, No. 29, p. 163. See also M. GAMA's Experiments on this subject. *Traité des Plaies de Tête*, p. 101.

the cranium may be the part struck ; or the patient, alighting on either the feet or the nates, may have the concussion conveyed to the calvarium through the spinal column.

This vibration of the brain, with disturbance of its circulation, and perhaps temporary condensation of its substance, is attended with symptoms of marked disorder in the organ's functions. Sensation, mental power, and voluntary motion are more or less disturbed ; and a depressing effect is exerted on the general circulation. The patient, stunned, and more or less insensible, lies motionless, pale, and cold. Insensibility, however, is found not to be complete except in extreme cases ; by loud calling, monosyllabic acknowledgment may be obtained ; by pinching the skin, or otherwise causing pain, some evidence is usually given of pain being felt, and an attempt is made by the patient to move the part from the supposed source of injury. Power of motion is depressed and latent, not destroyed ; and the voluntary muscles, though relaxed, are not truly paralyzed. Respiration is feeble, slow, and sighing. The pulse is rapid, small, and fluttering ; and especially weak at the extremities. The pupils are usually contracted, and insensible to light ; but their state is variable ; sometimes one is contracted, while the other is either natural or dilated. Squinting is not uncommon. Vomiting is often present ; rather of favourable portent than otherwise,—premonitory of recovery from this state of depression.

The patient becomes more easily aroused ; and responds more distinctly to interrogation, either by words or by gesture. Respiration becomes more full and composed. The pulse is less frequent, and more distinct ; but, at this time, the circulation is peculiarly irritable, the mere effort of change of posture usually inducing a very marked increase in the frequency of the heart's action. Pain now is more fully felt by the patient ; and is referred to the head. Vomiting may continue. The returning mental power is apt to prove errant and deceptive for a time.

Not unfrequently, a state resembling somnambulism continues for some hours during the transition to recovery. Motion, sensation, some of the special senses, and much of the mental powers seem to be restored, yet the patient remains as if in a

deep sleep. He may rise, wash, shave, dress, perambulate ; all the while unconscious.

But reaction seldom stops at mere restoration of the normal state ; the boundary of health is crossed, in an opposite direction. Reaction proves excessive ; and symptoms are evinced of an inflammatory process begun in the injured part—the brain, its membranes, or both. The pulse becomes full and hard ; the skin hot and dry ; the face flushed ; the eyes bloodshot ; the pupils more contracted and insensible to light. Pain, great and increasing, is complained of in the head ; restlessness increases ; the mind again loses its healthful balance ; delirium supervenes ; and so the symptoms advance. Resolution may occur. Or effusion accumulates ; coma is induced ; and the issue may be fatal.

Practically, concussion may be divided into three stages. 1. Depression ; marked by insensibility, and feeble circulation. This may be intense and enduring ; proving fatal, and that speedily—the patient quite unconscious throughout. 2. Reaction. The symptoms of depression pass off ; circulation is restored ; and cerebral function returns. In the slighter examples of injury, often no further progress is made untowardly. Reaction does not prove excessive. The head is confused and giddy for a day or two ; but the pulse remains quiet ; and, within a few days more, all has passed off in safety. 3. Excessive reaction. The inflammatory symptoms set in, and a state opposite to that of depression is established ; all is excitement and perversion, both in the general circulation, and in the functions of the brain ; and life is brought into imminent jeopardy, by phrenitis, or meningitis, and by proportionate inflammatory fever.

Treatment.—This necessarily varies according to the severity of the injury and the intensity of its results ; but more especially is it different at different periods of the case. In the first stage—that of depression—if we act at all, it will be with the view of favouring at least the commencement of reaction. An opposite procedure were plainly at variance with common sense ; but, unfortunately, it is found to be not equally at variance with common practice. A man stunned by a blow or fall, and labouring under simple concussion, is often bled on the instant—or an attempt, at least, is made to

bleed him—by the rash and thoughtless practitioner. In other words, a fresh and powerful agent of depression is exerted on the general circulation, when such depression is already great, and has perhaps brought life to the very verge of extinction. If blood flow from the wound in venesection, under such circumstances, perhaps life is lost ; at all events, the direct untoward result of the injury is aggravated ; and the case is rendered both more urgent and more protracted than it otherwise would have been. The lancet is certainly not to be used, during this stage. In many cases we should be little more than passive spectators. The depression is not extreme, nor giving indications of long continuance ; signs of reaction, on the contrary, are slowly manifesting themselves ; and we await the natural progress of events. Not altogether idle, however. Although not engaged in active treatment, we are preparing for activity, when circumstances shall call for our interference. The patient is stripped and put to bed. His whole body is carefully examined. He cannot tell us whether or not other parts have been injured, besides the head. We must ourselves carefully examine each joint and bone ; detecting fracture or dislocation, and having it immediately rectified, while circumstances are all so peculiarly favourable for the required manipulations. On recovering his senses, he has not to complain of a painful and distorted limb, now for the first time observed ; but finds what was distorted duly replaced, and already some way advanced in the process of repair. The head is carefully shaved ; and is placed on pillows, considerably elevated. If wound of the scalp exist, hæmorrhage is arrested, if need be ; and approximation is effected in the ordinary way.

Should the depression prove great and continued ; plainly indicating risk to life by syncope ; something more is required of the practitioner. He endeavours gently to originate reaction. Warmth is applied to the surface ; and friction is used over the chest and abdomen. If this be not sufficient to turn the course of the symptoms, a stimulant enema of turpentine is given. If still the progress be downwards, an attempt is made to convey to the stomach some warm tea, or soup, or wine and water ; and stimulants are held to the nostrils, for insufflation. These last, however, are always to be

warily managed, so as to avoid all risk of injury by their too free application to a patient at the time insensible of pain ; and the giving of fluids by the mouth, too, must be effected with care, lest they pass into the air-passages, and produce asphyxia. So soon as reaction has begun, we cease from our auxiliary efforts ; and again become passive onlookers ; completion of the second stage being always safest in the hands of Nature.

If stimulants are used at all internally, it must be only in urgent circumstances, and with much caution ; begun with a sparing hand, and repeated warily. And, in general, we are well content to do nothing, in this way ; knowing that moderate depression is a favourable occurrence ; and that premature cessation of it, especially when followed by abrupt and marked reaction, is apt to prove most injurious. For, at first, we can never be certain that the case is one of pure concussion. There may be a l esion, by laceration, of the brain's substance. During the existence of concussion's first stage, the case remains—practically—one of concussion still ; circulation is weak in the torn part, as elsewhere ; extravasation of blood does not take place from the open vessels ; valuable opportunity is afforded for their closure by natural h emostatics ; and when at last—it may be after some hours—the natural reaction slowly sets in, and circulation is proportionately restored, still no escape of blood occurs ; and the symptoms may remain those of mere concussion to the last. Whereas, had the period of depression been abridged, and reaction rendered not only premature, but also abrupt and active, circulation would have been restored in the injured part ere the open vessels had closed, blood would have been extravasated, and Compression of the brain must have ensued. Or, if no l esion of the brain have occurred, the case being in all respects one of mere concussion, still premature and excessive reaction is most hazardous ; by tending not only to kindle an inflammatory process in the brain or its membranes, but also to secure its being of an aggravated and perhaps uncontrollable character.

Thus, then, it is plain that two great errors may be committed in the treatment of the first stage of concussion. Blood may be drawn prematurely ; lowering the vital powers

still further ; unnecessarily, untowardly, perhaps fatally. Or stimuli may be imprudently employed ; too soon, and too freely ; hurrying on reaction ; and endangering life, either by compression in consequence of extravasation of blood, or by an inflammatory process of an urgent and untoward character. Let both errors be studiously avoided ; for each is of a most grave nature. While we take care that the depression does not proceed too far, let us beware of doing anything to effect either a premature or an excessive reaction. And when we attempt to fulfil the former indication, let us beware both of inducing asphyxia, by the misconducting of ingesta ; and of causing troublesome excoriation and subsequent inflammation in susceptible and important parts, by the spilling of irritant stimuli held to the nostrils.

In the second stage, while reaction is in progress, we have still either hand ready—to favour, or to repress—yet very often find it prudent to abstain from active interference ; leaving the task, almost entirely, in the more skilful and competent hands of Nature. We content ourselves by carefully excluding all source of excitement, either to the general circulation, or to the brain's function—more especially light and noise ; and cold is continuously applied to the shaven scalp, by wetted cloths, or by evaporating lotions. Such treatment is not calculated either to thwart or to prevent the normal amount and form of reaction ; while, at the same time, it leans to the side of repression sufficiently, to guard against the excess of reaction which not improbably is speedily to threaten.

It may happen that though the reactive effort is well begun, it ceases, flags, and retrogrades ; a period of depression again sets in ; and this relapse looks more formidable than did the first effect of the injury. Under such circumstances we are no longer inactive spectators ; but commence a cautious system of stimulation, as formerly explained. If, on the other hand—as more frequently happens—reaction threatens to prove both “fast and furious,” we interpose our repressing agency. We empty the bowels by the exhibition of an aperient enema ; and aid this, by the more leisurely working of an internal purge. Seclusion from light and noise, elevation of the head, and continuous application of cold, are most carefully main-

tained. And if still the action is sthenic and in excess, we prepare to obtain a sedative result by blood-letting.

In the third stage, when reaction is plainly in excess, and inflammatory symptoms are fast developing themselves, the treatment is decidedly and actively antiphlogistic. Quietude and seclusion are more strictly enforced than ever; it being all important to obtain *rest* of the organ affected, as completely as circumstances will permit. Blood is taken from both the system and the part; by venesection or arteriotomy, and by leeching. And such depletion is repeated as oft and as freely as circumstances seem to demand. Purgatives are actively administered; and it is well to remember that in inflammatory affections of the cranial contents, especially powerful doses are usually required. Antimony is given. And when the substance of the brain is plainly indicated as the site of the crescent inflammatory process, we do not hesitate to place the system rapidly under the influence of mercury, by exhibition of calomel and opium; having full warrant for this in the delicacy of structure and importance of function which are involved. (*Principles*, p. 128.) The opium is given in less quantity than usual; enough to prevent the purgative, and to secure the systemic effect of the mercury; not enough to endanger the production of narcotism and consequent determination of blood to the part affected.

Sometimes delirium, with convulsive movements, continues after full bleeding, and is aggravated by its further repetition. In such circumstances, the pulse and other characteristics of nervous reaction, (*Principles*, p. 116,) will be found; and relief will follow a more liberal exhibition of opium, guarded by antimony. (*Principles*, p. 132.) In the antiphlogistic management of advanced cases of injury of the head, the occurrence of convulsions is by no means to be considered as sufficient warrant for continuance and *pushing* of the antiphlogistics—especially blood-letting; for, often, they are found to be of an asthenic, or purely nervous character; aggravated by antiphlogistics, alleviated and checked by amendment of diet, and cautious exhibition of opium.

The brain and membranes, having recovered from the inflammatory process, remain long weak, and require still a

watchful and patient care. Light and noise must not be soon or abruptly admitted. Conversation, reading, thought, or other exercise of the mental powers, must be discouraged rather than otherwise. Even the functions of special sense must be held in comparative abeyance. The head is kept shaven, elevated, and cool. Food is sparing and non-stimulant. The bowels are kept freely moving.

If resolution do not occur, exudation and effusion take place ; compression of the brain supervenes on the concussion ; coma is formed ; and the case becomes one of the utmost danger. There is now no tolerance of active antiphlogistics. The lancet is laid aside. Purging is continued. And the main reliance is placed in powerful counter-irritation.

Even without effusion, recovery from concussion is often tedious, and imperfect. The eye remains wild and vacant in expression ; memory is impaired ; conversation is childish, and often incoherent ; sometimes the demeanour is timid and gentle ; sometimes the patient is very irascible, and apt to be moved to much violence. In short, there remains an imbecility of the whole mental powers. In other cases, certain only of the mental faculties thus suffer ; and of these, memory is the one most frequently affected. Sometimes the recollection of all past events is either lost or obscured ; sometimes a portion of these remain tolerably vivid and distinct. Sometimes the past is untouched, and the present only affected. Extraordinary results have occurred, in regard to languages ; when the knowledge of a plurality of these has been previously possessed by the patient. Certain of them have gone quite from him ; and on recovery from the first effects of concussion, he has spoken with fluency, and continued to do so, in a tongue to which he had been long a stranger.*

Again, intellect may remain clear and entire, while special sense sustains an injury. Hearing and smell may be lost, impaired, or perverted. Weakness of sight, with or without squinting, is no uncommon result.

Such remote and chronic consequences of concussion may prove but temporary ; or they may remain for life. The affections of the mind, are especially liable to prove obstinate ;

* Sir A. COOPER'S *Lectures*, p. 112.

and ought always to receive a very guarded prognosis. The treatment found most suitable, consists in a mild alterative mercurial course, with moderate and long-continued counter-irritation ; an uniformly lax state of the bowels, and occasional purging ; a most carefully regulated diet ; restriction to moderate exercise of both body and mind, but more especially of the latter ; avoidance of all sources of mental excitement, especially of such as are known to be besetting to the patient ; the use of the cold shower-bath ; and residence in suitable exposure and climate.

Many patients recover, to all appearance, perfectly from concussion ; and yet are subject to frequent and unpleasant remembrances of the injury. On attempting any unusual exertion, either of mind or body, or on the occurrence of any otherwise trifling stomachic or intestinal disorder, intense headach supervenes, with some fever, and perhaps attended with disorder of sight or other special sense. Or, by even slight indulgence in wine, they are liable to undergo great mental excitement, little short of temporary delirium or insanity. Such persons, it is obvious, ought to pay great attention to regimen, to the state of the bowels, and to the avoidance of all circumstances likely to excite, or cause determination to the cranial contents. Indeed, it may be laid down as a safe general rule, that all who have once sustained any considerable concussion of the brain, must ever after regard their head as a weak point, which requires constant prophylactic care. And, for some time immediately succeeding the infliction of the injury, this truth should be more especially forced upon them. For, many most serious cerebral disorders have been the result of premature return to bodily exercise, mental occupation, or pleasures of the table, after a concussion thought at the time to be but very trivial.

A very insidious, and consequently dangerous, affection of the brain is apt to ensue as a remote consequence of concussion, more especially in young people. A slight injury of the head has been received, by a blow or fall ; and its immediate effects seem to be satisfactorily recovered from. Weeks—or, it may be, months—afterwards, the patient is out of health ; he loses colour, appetite, flesh, and energy both of body and mind ; he is subject to headach, and occasionally

complains of giddiness ; the skin is dry and feverish ; the secretions are altered ; the eye has an unwonted expression, rather of languor than of excitement ; the stomach is irritable, and occasionally rejects food ; sleep is disturbed and unrefreshing. The ordinary remedies, directed to stomach, skin, and bowels, fail to relieve. The general ailment continues slowly to advance. By and by, the head symptoms assume a pre-eminence ; and at no distant period from that event, symptoms of pressure on the brain become plainly manifest. Very probably the issue is fatal. An inflammatory process has been slowly advancing in the cerebral substance ; suppuration has at length occurred ; and, in consequence, it is not unlikely that an acute accession has supervened on the previous chronic change of structure.

It is very obvious how the inobservant practitioner must be apt to mistake the true nature of such cases. The head is not suspected of originating the evil, until towards the close ; when treatment, however suitable, can prove of but little avail. Diet is attended to ; laxatives are given, then alteratives ; and then, probably, tonics ; all without relief ; the last class of remedies inevitably inducing marked aggravation of the disorder. It may be that the treatment is from the first of a tonic nature, and blindly persevered in, notwithstanding its manifest failure ; the result is consequently still more untoward ; coma is rendered more early, more urgent, and more hopeless, than it otherwise might have been. The treatment, on the contrary, should be such as to counteract a chronic inflammatory process ; and should be conducted with such care and skill as the importance of the texture implicated so imperatively demands. Leeches are applied to the temples or occiput ; and are repeated, perhaps, once and again. The head is shaved, and moderate counter-irritation is patiently maintained. A mild course of mercury is given. The intestinal and other excretions are attended to. Diet is sparing, and most carefully regulated. All excitement of both body and mind is avoided. And such treatment must be duly maintained, notwithstanding the patient, or other inexperienced observers, may not scruple to say that its rigour is quite disproportionate to the importance of the case. The surgeon knows the insidious and covert nature of the evil

with which he is called upon to cope ; and is not deceived by appearances. His main difficulty may lie in enforcing the measures which he knows to be essential. It were well that patients were in general as fully convinced, as are the members of the medical profession, of the truthfulness of the axiom, that "no injury of the head is too slight to be despised ;" and that whenever any serious concussion has been sustained, the greatest prophylactic caution is expedient, for weeks after the infliction of the injury. For, during that time, the brain continues not only predisposed to assume the inflammatory process, of a low type, but is also ill able to resist or control its advance.*

It is needless to expose the unsuitableness of the operation of trephining, in all cases of simple concussion.

Compression of the Brain.

It is unnecessary here to consider the question, Whether the substance of the brain is capable of condensation by pressure or not. We know that pressure applied to it, according to its suddenness and intensity of application, produces derangement of the functions of that important texture ; and the consequent train of symptoms, varying in degree, are usually termed those of "compressed brain," or of "compression."

In concussion, the whole brain is affected ; in compression, a portion only is acted on. In the one case, the cause of disorder is of temporary application ; in the other, it is of some duration. The symptoms, therefore, may naturally be expected to differ. In concussion, the depressing effect on the heart and general circulation is immediate and prominent ; and the patient lies pale, cold, and pulseless. In compression—the injury being limited to but a part of the brain—the heart's action may, at first, be little if at all affected ; the skin, consequently, may retain its warmth and hue, and the

* "It will in general be found very difficult to persuade a person who has had what may be called only a knock on the pate, to submit to discipline, especially if he find himself tolerably well. He will be inclined to think that the surgeon is either unnecessarily apprehensive, or guilty of a much worse fault ; and yet, in many instances, the timely use or the neglect of this single remedy (blood-letting) makes all the difference between safety and fatality."—PORT, i., 47.

pulse its fulness. In concussion, immediately fatal, death takes place by syncope. In compression, the fatal result is due to coma. The essential peculiarity of the latter fatal effect is, "that respiration takes place imperfectly, and ultimately is suspended, probably by reason of the defect of sensation. The circulation, and sometimes the animal heat, not only continue entire up to the moment when the last breath is drawn, but even survive the respiration for a short time; during which time, of course, venous blood moves along the arteries; but the venous blood, according to the general law established in the physiology of respiration, soon ceases to make its way through the capillaries of the lungs, and the circulation is therefore soon brought to a stand."

We know from physiology, that the part of the nervous system which must be specially affected in these cases, when the failure of respiration is the immediate cause of death, must be at the sides of the medulla oblongata; but the part visibly injured is often considerably distant from this."*

Pressure may be made on the brain in various ways. By extravasation of blood; in its substance, on its surface, or between the membranes. By formation and accumulation of pus, or other products of the inflammatory process; also, either cerebral or intra-membraneous. By fracture of the cranium, with depression of the broken part or parts. By the lodgement of foreign bodies in the brain, or on its surface. By the formation of adventitious growth, in connexion with either the cranium or its contents; exostosis, osteosarcoma, or osteocephaloma of the cranium; tubercular, or other tumour of the brain or its membranes. It is probable that compression is also occasioned by mere congestion; a state of over-distension of the blood-vessels, with advancing serous effusion therefrom.

It is highly important to bear in remembrance, that symptoms precisely similar to those ordinarily produced by compression of the brain, may be, and frequently are, induced by other circumstances, when no apparent pressure is in operation. Certain poisons, for example, have this effect. But, what is of more consequence, in a surgical point of view, such

* ALISON, p. 8.

a train of symptoms almost invariably attends on disorganization of the cerebral tissue by inflammatory action ; and that, too, when the inflammatory products seem to be of such a nature as is not calculated to occasion pressure in any great degree.

In surgery, we have chiefly to do with those examples which are induced by depressed fracture, extravasation of blood, inflammatory exudation, and suppuration.

The most characteristic symptoms are to be found affecting the respiration and the pulse. Breathing is slow, labouring, and loudly stertorous ; in concussion it was gentle and sighing. A peculiar whiffing, by the mouth, is not unfrequent, during expiration—as is observed in smoking, or in the ordinary repose of heavy sleepers ; it is a symptom of untoward portent. The pulse is distinct and full, usually slow, but often at first not much altered as to frequency—not unfrequently intermittent ; in concussion it was from the first rapid, low, and feeble, perhaps wholly imperceptible. Loss of consciousness is more complete than in concussion ; the patient cannot be roused by any movement or noise. Loss of sensation is more complete ; he may be pinched, or burnt, without in any way evincing perception of pain. Special sense is wholly dormant ; he neither sees, nor hears, nor smells ; at least no result follows the application of stimuli to the eye, ear, or nose. Power of motion is wholly gone ; the voluntary muscles are relaxed, flabby, and powerless ; the limbs lie loose and incapable of motion. The eye is fixed ; its pupils are dilated, and insensible to light. The skin is of a normal temperature, or perhaps even warmer ; not unfrequently wet with perspiration ; in concussion, it was cold, pale, and shrunken. The sphincters are relaxed ; fæces pass involuntarily. Expulsive muscles are similarly affected ; the urine is, in consequence, retained—or, from paralysis of the sphincter as well, the urine may pass off involuntarily, not in a stream, but insensibly by drops.

Such is the general character of the symptoms peculiar to compression ; varying, of course, in degree, according to the amount or nature of the injury sustained. They are of immediate or secondary accession, according to the cause ; immediate, when the consequence of sudden hæmorrhage, depressed

bone, or impacted foreign body ; secondary, when the result of tardy extravasation, suppuration, or inflammatory exudation. However originating, they are, after a time, masked and modified by the results of the inflammatory process which seldom fails to become established in the injured part.

But the brain has the power of recovering from the effects of pressure to a certain extent, even although the agent of compression undergo no alteration ; the organ seeming to accommodate itself gradually to its change of circumstances. Thus, in depressed fracture, symptoms of compression may be at first marked and even urgent ; and yet may pass off in a day or two, without any elevation of the depressed portion of bone. This being borne in mind, we can readily understand, how, by the time that the inflammatory process has begun, the symptoms of compression, at first marked, may have, in a great measure, passed away ; and how the case, consequently, may only present the ordinary symptoms of urgent inflammatory action in the brain and its membranes. This is something more than mere masking of compression, by the inflammatory process ; it is supersedence. Certain functions of the brain are plainly re-established, though perverted ; convulsive movements of the limbs occur ; and delirium may supervene.

Compression may, like concussion, prove directly fatal ; the patient perishing by coma. Or—when the cause of pressure is removed, or even, as already stated, independently of this—the symptoms gradually abate, and the patient slowly recovers. Or, ere yet any great mitigation in the symptoms of compression have occurred, those of an urgent inflammatory process kindled in the injured part become established ; and these prove fatal. Or, a similarly fatal issue may take place, through inflammatory action, even although the immediate effects of compression had seemed to have been recovered from.

The indications of the treatment adapted to compression are sufficiently simple. To remove, if possible, the compressing cause. To watch the subsequent favourable progress of the organ to resumption of its normal state and function. To interpose, if need be, to avert inflammatory action. And to oppose the untoward advance of this, when unfortunately it

has become established. When symptoms of simple compression persist, without any opportunity being afforded of removing the cause of pressure, to maintain, by the suitable means, the action of the heart and lungs ; so as, if possible, to afford time for the brain, by accommodating itself to its altered circumstances, slowly and imperfectly to resume its functions.

Between pure examples of Concussion and Compression of the brain there is no difficulty in drawing a sufficiently broad distinction ; in practice, as well as in theory. The one, a case of syncope ; the other, one of coma. In concussion—the symptoms immediate ; insensibility incomplete ; the organs of special sense capable of being roused ; the muscles contractile, and the limbs, under strong stimulus, undergoing movement ; the breathing soft and gentle ; the pupils not uniformly dilated, though insensible to light ; the pulse rapid, small, indistinct, perhaps for a time imperceptible ; vomiting ; no involuntary evacuations ; the skin cold, pale, and shrunk. In compression—the symptoms not necessarily immediate ; insensibility complete ; the organs of special sense incapable of being roused ; the muscles relaxed, paralyzed ; the limbs motionless, until recession of the state of compression, and advance of the inflammatory process ; breathing laboured, slow, and snoring ; the pupils dilated and insensible ; the pulse slow, distinct, perhaps full, sometimes intermittent ; no (or seldom) vomiting ; fæces passed involuntarily ; retention or dribbling of urine ; the skin warm, and often bedewed by perspiration.

But it is very plain that comparatively seldom will pure examples of either state be presented to the surgeon. The blow or fall which produces severe concussion, is very likely to cause also laceration of the substance of the brain, or rupture of a vessel in the membranes, whence blood will escape, sooner or later, inducing a certain amount of compression. And, on the other hand, the injury which causes compression, whether by fracture or extravasation, must, at the same time, and primarily, have caused more or less concussion. In consequence, the two states, and their corresponding symptoms,

are often—nay, usually—more or less commingled. According to the preponderance of either class of symptoms, the case receives its title ; and, sometimes, it is not easy to say to what side the preponderance is inclined.

There is one class of cases, however, sufficiently distinct. The ordinary symptoms of concussion follow on an injury of the head, and the patient rallies from them. Consciousness is completely restored, and is retained for some time. But, without the operation of any new external cause, insensibility returns ; unconsciousness is more complete than before ; and the symptoms now will be found presenting the characters of coma. Here is a combination of concussion with compression ; yet there is no difficulty in separating the case into its two component parts. The first insensibility was that of concussion ; the second is undoubtedly due to compression. If the interval of consciousness have been brief—of hours—the compressing agent is, doubtless, extravasated blood ; if it have been of considerable duration—days—the compressing agent is pus, or other inflammatory product.

It is right also to remember that, not unfrequently, part of the insensibility attendant on injuries of the head, may be attributable to intoxication ; and that although this influence is of a transient nature, and to that extent favourable, yet that it predisposes to inflammatory accession, and so is of a precisely opposite character.

Compression by Extravasation of Blood.

Escape of blood may take place, immediately on infliction of the injury ; or not until reaction has followed on the direct effects of concussion. During the depressed state of the circulation which obtains during the first effect of the injury, no blood may escape from even extensive cerebral laceration ; but, if reaction be both speedy and intense, even the slightest læsion will be certain to afford a dangerous amount of that fluid.

The extravasation may be variously situated : between the skull and dura mater ; between the membranes ; on the surface of the brain—on its hemispheres, or at its base ; within the ventricles ; or infiltrated into broken-up cerebral substance.

For practical purposes, it is sufficient to divide compressing extravasations into two great classes ; those which are exterior to the dura mater, and those which are within that membrane.

I.—*Extravasation between the bone and dura mater.*

One of the effects of a fall or blow on the head is, by disruption of the soft parts constituting the scalp, to produce more or less swelling by sanguineous infiltration of that texture. Occasionally, a similar result is produced on the internal aspect of the part of the cranium struck, in the cellular and vascular connexions of the dura mater with the bone. These being torn, escape of blood follows ; either at the time, or subsequently on reaction ; or at both periods ; sparingly at first, more profusely afterwards. If any considerable vessel have been torn, the extravasation may be expected to be both instant and great. By such anormal accumulation of blood, the dura mater is proportionally bulged inwards ; and compression of the brain necessarily results. The blood, as in other examples of extravasation, is at first fluid, but sooner or later assumes the solid form ; or, rather, by coagulation it separates into clot and serum.

Extreme cases of this nature, it is plain, are most likely to occur when the injury has been inflicted in the course of the middle meningeal artery. And, to occasion rupture of that vessel, it is not essential that fracture of the super-imposed bone should take place. Mere concussion may suffice. If compound fracture exist, the blood is more likely to escape externally, than to accumulate, to any inconvenient amount, between the bone and membrane.

As indications of the event :—In addition to the ordinary symptoms of compression, we have the site and nature of the injury favourable to the occurrence. A smart blow has been received in the course of the meningeal artery ; and is speedily followed by urgent symptoms of compression.

Such compression may be so grave as to cause death, by its direct effect. Or, the further escape of blood ceasing, the brain begins to accommodate itself to the amount of pressure already applied ; at the same time, the compressing agent is

being gradually diminished in bulk by absorption of the extravasated blood ; and the patient slowly recovers. Or the inflammatory process is kindled after a time ; and unhealthy suppuration is apt to ensue ; reinducing symptoms of compression, more urgent than before, after perhaps a considerable interval of consciousness.

Treatment.—When the circumstances of the case are such as to leave little doubt as to the occurrence of this form of extravasation, at an accessible and defined portion of the skull, we can have no hesitation — if the symptoms of compression are urgent—in using the trephine ; for the purpose of exposing the site of extravasation, and effecting relief by evacuation. If the blood be still fluid, it escapes at once ; if coagulated, the solid portions may, if need be, be detached by a probe—delicately used.

Unfortunately, we cannot be certain, in almost any case, of the exact site of the extravasation ; and, consequently, both our operation and prognosis require to be extremely guarded. A concussing blow operates chiefly on two parts of the cranium ; the part struck, and the part immediately opposite ; the one effect often termed the *coup*, the other the *contrecoup*. It not unfrequently happens that extravasation takes place in the latter situation ; not at the part struck. Yet, failing in our search at one point, we are scarcely warranted in making a similar attempt at the other ; for the extravasation may be yet elsewhere, in a site not ascertained, and perhaps inaccessible.

If the symptoms of compression be not urgent, we do not interfere by operation. The brain gradually recovers. The extravasation is slowly absorbed. Our duty is to avert inflammatory action, if possible, by the ordinary means ; to moderate it, should it occur.

II.—*Extravasation of Blood on, or in the Brain.*

As already stated, the blood may be variously situated ; intra-membraneous ; diffused on the surface of the hemispheres, or at the base of the brain ; within the ventricles ; or infiltrated into the cerebral tissue. And, unfortunately, the most careful examination of the history, symptoms, and progress of

the case, will not enable us to ascertain, with anything like certainty, the exact site of the extravasation.

The symptoms are those of compression ; more or less urgent in their character, and more or less speedy in their accession, according to the site, amount, rapidity, and time of the extravasation. Usually, the escape of blood is not immediate—at least to such an extent as to cause symptoms of decided compression—but secondary, on the occurrence of reaction. The patient may have been from the first insensible, by concussion ; and this minor insensibility may be simply merged in the major insensibility of compression ; or between the two there may be a greater or less interval of consciousness. The cerebral or membranous læsion, which permits the sanguineous escape, may follow on a mere concussive injury of the cranium ; on extensive fracture of the cranium, with or without depression ; on mere fissure of the cranium—more especially when this is situate at the base ; or on a penetrating wound, of any kind.

The prognosis is as in the case of extravasation exterior to the dura mater. The brain may recover, and the extravasation be absorbed : or the brain, recovering partially from compression, suffers, perhaps fatally, by inflammatory accession—immediate or remote ; or the compression is most urgent, and directly terminates existence by coma. Rapidity of extravasation is more important than the amount ; and the site of the escape is of more consequence than either. A comparatively small quantity of blood rapidly, or at once, extravasated, will induce more urgent symptoms of compression than twice the amount which has slowly oozed from the torn vessels ; and while a large flat coagulum may press with comparative impunity on the upper and anterior part of the hemispheres, a slight amount of blood acting on the base of the brain—more especially at its posterior part—never fails to induce the most serious and urgent consequences.

Treatment.—Prevention may be in our power. Concussion may occur, along with slight læsion of the cerebral substance ; and from this læsion little or no blood may escape during the period of depression. The injury having been such as to engender a suspicion of these circumstances, it is

plainly our duty to protract and repress reaction ; when it does occur, to endeavour that it proceed slowly and calmly ; or, if need be, by bleeding from the system, to reinduce the state of depression, and maintain it during a second period. The object being, to afford time and opportunity for efficient occlusion of the injured vessels by the natural hæmostatics. If too late, or otherwise unable, to prevent ; we may yet hope to moderate and limit the extravasation. And this is to be effected by opposing reaction ; keeping the patient quiet, with the head elevated ; applying cold to the head, face, and neck ; interdicting all ingesta ; taking blood from the system, as circumstances may require ; and acting freely on the bowels by purgatives. Our object still is to have not only the general circulation quiet and gentle, but to have blood circulating within the cranium as sparingly and as calmly as is compatible with such maintenance of the cerebral functions as is essential to life.

Extravasation having ceased, we hope that in due time the symptoms of compression will begin to abate ; the brain accommodating itself to the compressing agent, and this latter beginning to diminish by absorption. We ward off inflammatory symptoms, should they threaten ; and maintain strict rest, quietude, and regimen ; the last being most guarded in regard to both fluid and solid ingesta, in order that there may be a state of system not only unfavourable to inflammatory accession, but also favourable to absorption of the extravasated blood. Unfortunately, we have no direct means of assisting in the latter indication.

A paramount indication undoubtedly is, removal of the compressing cause, the extravasation. This can be artificially effected only by operation ; by removing a portion of the cranium ; puncturing the membranes, if need be ; exposing the site of extravasation, and permitting—if not effecting—external evacuation. Were the operation of trephining capable, always, or even often, of achieving this result, it would be held as generally advisable in such cases. As it is, however, the profession is much divided upon this question ; some in favour of, others opposed to the proceeding. Among the latter we would beg to be enrolled ; and for the following reasons :—1. It is difficult, if not impossible, to

determine, at what part of the periphery of the cranial cavity the extravasation has occurred ; whether at the point struck, or at the site of the contrecoup, or at some other part—superiorly, or laterally, or at the base. 2. It is equally difficult, if not impossible, to determine previous to the operation, at what part the extravasation has occurred, as regards the diameter of the cranial cavity ; whether between the membranes, on the surface of the brain, within its ventricles, or in its broken up tissue. 3. Supposing that the extravasation has been reached and exposed, it may be found either difficult or impossible to effect its removal. Coagulation has taken place. The fluid portion trickles away at once ; but the clot is expanded in the form of a flat and broad cake, which cannot be dislodged and extruded without the infliction of such further mechanical injury as shall render the occurrence of disastrous inflammatory action inevitably certain. 4. Supposing that the coagulum has been exposed and not removed, the patient is obviously much more unfavourably situated after than before the operation. Now there is a certainty of inflammatory accession—in addition to the evil of compression, unrelieved ; and, under the combination, it is but too likely that life may give way. Before, there was but the compression ; the inflammatory process might have been averted ; the brain, by accommodation, might have gradually recovered.

Thus, then, we hold, that in the case of compression by extravasated blood, the operation of trephining is to be considered as generally inapplicable. Operating, we are uncertain whether or not the trephine is over the site of extravasation ; we are uncertain whether it may be necessary to puncture the membranes of the brain—and, that having been done, we may still fail in exposing the blood ; we are uncertain of being able to remove the blood, even after it has been exposed ; and we are almost certain to light up an inflammatory process of a most urgent, and perhaps unmanageable, character. In other words, we are sure to inflict injury—by perforation, and exposure ; we may succeed in counterbalancing this injury by a preponderating amount of benefit—by extrusion of the compressing agent, the escaped blood ;

but we are fully more likely to fail in obtaining the contemplated advantage ;—and then the proceeding proves to be altogether injurious.

But to all general rules there are exceptions. And here the exception consists in those cases of injury applied in the course of the middle meningeal artery, immediately followed by urgent symptoms of compression, with or without fracture of the skull, in which we can have little doubt of the following circumstances :—1. That the compression is caused by extravasation of blood ; 2. That the blood has been extravasated at or near the point struck ; 3. That the extravasation is situate exteriorly to the dura mater ; 4. That the blood is yet mainly fluid, and therefore likely to escape readily externally, on an aperture of communication being established ; 5. That even if it have coagulated, extrusion may yet be effected, without necessarily exciting inflammatory action, either in the brain or in any of its membranes. Under such circumstances, we need not hesitate to apply the trephine to the injured part—when the symptoms of compression are sufficiently urgent to demand direct interference—with the full hope of affording most important and salutary relief.

We can also conceive it possible, that an injury may be sustained at a part of the cranium not connected with the course of the meningeal artery ; that the symptoms of compression by extravasation may be both very urgent and very plain ; and that the surgeon, after careful examination and consideration of the case, may feel satisfied that the site of extravasation corresponds to the part struck. The trephine is applied. If blood be found at that part, exterior to the dura mater, the issue is most fortunate. But if no blood be found, two questions naturally arise ; Are the membranes of the brain to be perforated ? or is another part of the cranial contents to be exposed by reapplication of the trephine ? The latter question is certainly to be answered in the negative ; the former, in the affirmative, only when the dura mater is elevated through the trephine-hole, tense, comparatively non-pulsating, perhaps fluctuating, or otherwise affording tolerably distinct evidence of the sought-for blood being lodged beneath.

Compression, by the accumulation of pus between the Cranium and Dura Mater.

This occurrence may be preceded or not by sanguineous extravasation. There may be at first disruption of the dura mater from the internal surface of the cranium, with accumulation of blood between. This may take place to such an extent as to cause compression of the brain. This organ slowly recovers; and the patient seems convalescent. But, after some days, the inflammatory process is kindled in the injured part; suppuration occurs, and the internal bruise degenerates into an unhealthy abscess.

Or there may be no previous extravasation. The bone and dura mater sustain a shock by the injury, but undergo no disruption either of themselves or of their connexions. There may be at first some symptoms of concussion; these pass away; but convalescence is interrupted by febrile disturbance of the system, followed by symptoms of compression. The inflammatory process has been established in the cranium, in the dura mater, or in both; and abscess forms between. The inflammatory action may have originated in the membrane, or in the connexions of this with the bone, or in the bone; or it may have begun in the diploë, causing abscess there, and extending inwards; or the origin may have been exterior to the cranium, in the soft parts, secondarily involving the corresponding portion of the interior.

If a portion of the cranium have been rudely stripped of its pericranium, it may die; but it does not necessarily do so—as was formerly stated. Should necrosis take place, and involve the whole thickness of the skull at that point, there is necessarily detachment of the dura mater, interposition of pus between it and the bone, consequent bulging inwards of the membrane, and proportionate compression of the brain. But detachment of the pericranium, with advancing necrosis of the external part of the bone, does not necessarily imply a corresponding state of matters within. The issue may be, and often is, merely an external exfoliation. The dura mater is a more important and efficient membrane than the pericranium, as regards vascular nutrition of the bone; de-

tach the dura mater, and the bone may hardly live; strip off the pericranium, and exfoliation is by no means inevitable. If the injury have not only denuded the external table of its investing membrane, but have also removed, at a corresponding point, the dura mater, by disruption and consequent extravasation, necrosis of the portion of bone so circumstanced, necessarily involving accumulation of pus between the dura mater and cranium, is inevitable. Also, if the dura mater be alone detached, and subsequently suppurate, necrosis of the entire thickness of the bone is still more than probable, though there may not be even an external wound.

However occasioned, the symptoms of compression from this cause differ very obviously from those produced by extravasation of blood. They are not of early occurrence; days, and sometimes weeks, elapse, between their accession and the infliction of the original injury. Whereas, compression by escape of blood is either immediate, or removed from the time of infliction only to the extent of a few hours, at the utmost. Also, in the case of abscess, the symptoms of compression are invariably preceded by signs of the inflammatory process, which causes the suppuration. As regards the result, the difference is still more striking. In compression by blood, the extravasation may cease, the blood is absorbed, and the brain recovers. But, in compression by pus, the compressing agent is ever on the increase; the abscess enlarges more and more; pus is but little amenable to absorption; the bone is exfoliating, and, if it were separate, the matter would doubtless find an outward escape; but exfoliation is a tedious process; ere it has been accomplished, the membrane, growing more and more tense, and itself involved in structural change, ulcerates, or sloughs; purulent irruption takes place inwards; and a more extensive, serious, and uncontrollable inflammatory action necessarily ensues. Or, previous to the giving way of the dura mater, a minor, yet equally fatal inflammatory extension inwards, by contiguity, may have occurred.

The symptoms denoting formation of this dangerous abscess are two-fold; as affecting the system; and as affecting the part. A man receives an injury of the head, without fracture of the cranium. He may undergo concussion or

compression by extravasation ; one or other, or both ; or he may not. If he does so suffer, he rallies ; and, for a time, he seems advancing favourably towards complete recovery. But, after some days, he becomes restless, wakeful, and generally uneasy ; his pulse rises and gets hard ; the skin is hot and dry ; and the other symptoms of inflammatory fever present themselves—moderate or intense, obscure or manifest, according as the inflammatory process happens to be chronic or acute ; very frequently it is the former. Pain is complained of in the head ; the eyes change their expression ; and the cerebral functions begin to evince disorder. Rigor occurs, and is repeated. Suppuration is begun ; and then supervene, more or less rapidly, the symptoms of compression—masking, in their turn, those of the inflammatory character. Then, as to the part. The bone is in a state of necrosis ; and this condition will certainly be indicated externally. If there be a wound, the granulations, instead of presenting the appearance of health and healing, will disappear, or become pale and glassy ; and the discharge may for a time cease—returning thin, non-laudable, perhaps sanguineous. If the pericranium be exposed, it will be found separating more and more from the bone beneath, with pus interposed. If the bone be denuded, it will be found white, dry, sonorous, non-vascular—in fact, at first dying, and speedily thereafter dead. If the scalp have not been divided, either by accident or by design, it is the seat of what is termed “the puffy tumour ;” a swelling of greater or less extent, caused partly by the accumulation of pus between the necrosed bone and its pericranium, partly by change of structure in the soft parts exteriorly, which are involved more or less in the extending inflammatory process, and are consequently the seat of effusion and exudation.—(*Principles*, p. 53.)

These symptoms, local and constitutional, occurring together, denote interior suppuration at the injured part. The local signs “following a smart blow on the head, and attended with languor, pain, restlessness, watching, quick pulse, headach, and slight irregular shiverings, do almost infallibly indicate an inflamed dura mater, and pus either forming or formed between it and the cranium.”*

* POTT, i. 41.

The general principles applicable to the treatment of abscess, must be carried out, if possible. The pus must be evacuated externally; and that at as early a period as possible; as soon as we are satisfied, by the conjunction of the local and constitutional signs, that matter has formed. The local symptoms alone are not a sufficient warrant for operative interference; neither are the constitutional; but, when they come together in a marked and plain form, the surgeon is culpably negligent who withholds the use of the trephine. By this instrument—chosen of a large size, to make the probability all the greater of disclosing the suppurated part—the dead portion of bone is perforated; and the abscess is discharged externally, with immediate relief to the symptoms of compression. Be it remembered, however, that those of inflammation still remain, perhaps aggravated by the addition which the injury of the operation has occasioned. Antiphlogistics must still be continued; and much careful management is required, even in the most favourable cases, ere the patient is conducted to safe completion of the cure. It may happen that the inflammatory action is not checked; but, spreading both widely and in depth, proves ultimately fatal. In short, while it is obvious that the only chance of the patient's safety is by artificial evacuation of the matter, it is equally plain that the operation alone will not suffice, but must be followed up by the most careful general treatment. It has happened that the abscess, burrowing between the dura mater and bone, has eventually reached the internal ear, and discharged itself externally by the meatus; the patient recovering. But, obviously, such an occurrence is a rare exception to a general rule, and cannot be trusted to in practice.

If, on removing a portion of the skull by the trephine, matter is not found, a question arises, whether our efforts at direct relief are to cease, or whether further exploration is to be attempted. Is the dura mater to be perforated, in the hope that the site of abscess may prove to be beneath? Not, if the membrane present its usual normal characters at the part exposed; level, moving synchronously with the cerebral mass, smooth, of a brownish hue, and shewing something of a silvery lustre. But if it be protruding through the cranial

aperture, flocculent, non-pulsating, and either too dark or too pale in colour—and, more especially, if it afford anything of a feeling of fluctuation when touched—we need not hesitate to puncture, and need not doubt to find an issue of purulent or other fluid from the wound. If the dura mater appear sound, and its puncture consequently be unwarrantable, are we permitted to reapply the trephine; either at the site of contrecoup, or in the immediate vicinity of the first application? Either of these procedures may be warrantable, if the symptoms of dura-matral abscess are peculiarly marked, and the surgeon is thoroughly convinced of its existence. But, as can readily be understood, the latter site of reapplication is the preferable. And, as already stated, a large size of trephine should be employed at first, to anticipate the necessity of such repetition. Only in very extreme cases, should the site of contrecoup be trephined. Having failed in the indicated spot, we proceed to other explorations with great uncertainty. Fortunately, however, it is comparatively seldom that the site of abscess is elsewhere than at the indicated part.

But, if the case be under our cognizance from the first, we should have a higher aim than the mere exercise of our art by operation; seeking to prevent the formation of the abscess, not to attempt its cure. The patient who has sustained an injury of the head, of any severity, is carefully watched throughout the whole period of convalescence; and the first symptoms of inflammatory accession within the cranium are met by active and sustained antiphlogistics—more especially blood-letting, quietude, avoidance of all stimuli of both part and system, low diet, purgatives, and perhaps calomel and opium; assisted, if need be, after a time, by counter-irritation.

When suppuration has taken place, either in the substance of the brain or on its surface, the case is obviously not amenable to direct surgical interference, and may scarcely fail to prove fatal. Cure is beyond our reach; but prevention was not. And the latter indication should sufficiently occupy our regard in the previous treatment of the injury.

When a severe scalp wound has been sustained, with bruising or fissure of the bone, it is not uncommon for the character of the wound to degenerate as in the case of dura-matral abscess, with some constitutional disturbance of an unpleasant character. But neither the meningitic symptoms, nor those of compression, appear. Suppuration has taken place in the diploë, with or without phlebitis there. If fissure exist—perhaps extending only through the external table—the pus will be found slowly oozing outwards; enlargement of the chink is necessary, however, for more free evacuation. If there be no previous solution of continuity, the trephine is to be used for removal of a portion of the external table.

The mischief may extend inwardly, and dura-matral abscess form, as previously stated; but, fortunately, such is by no means the invariable result; and is indeed little likely to occur, if the suitable treatment have been adopted.

If phlebitis occur in the diploë, the case becomes eminently serious; partly on account of the direct effects of this disease; partly on account of the risk of secondary abscesses forming in internal organs—lungs or liver. (*Principles*, p. 480.) After injuries of the head, abscess of the liver is by no means uncommon; and it is possible that, at least, many of the cases are connected with inflammation of the veins.

Fractures of the Cranium.

In the child, much violence may be sustained by the cranium, with impunity. The osseous tissue is then pliable; it yields to the force, and is temporarily depressed, but without solution of its continuity; and, after a time, the depression is gradually effaced by a vital resilience, independent of external aid. In the adult, and more especially in the aged, the bone is of a much more brittle nature; and less force succeeds in effecting solution of continuity, more or less extensive. The skull may be merely fissured; or the injured part is broken into fragments, implicating the whole thickness of the bone, with or without depression of these; or the external table alone is broken; or the internal table exclusively suffers; or both are penetrated by a sharp pointed weapon, the internal sustaining the greatest amount of in-

jury. The fracture may be at any part of the periphery of the cranium, or may traverse its base ; and, further, it may be either simple or compound.

The dangers attendant on the injury are various. 1. By concussion. 2. By extravasation of blood within the cranium. 3. By excessive escape of blood externally from the wound. 4. By displacement of the fractured portions inwards, causing compression. 5. By inflammatory action, occurring in either the brain or its membranes. The treatment will comprise various indications calculated to oppose these several results.

Fractures of the cranium, whether simple or compound, unite only by definitive callus. (*Principles*, p. 678.) Want of the provisional callus, doubtless, delays completion of the healing process ; but all incommoding of the brain or its membranes, by osseous bulging, is avoided—which otherwise could not fail to occur.

Fissure.

Capillary solution of continuity is, in itself, a thing of but little importance. But the force which has caused it may well occupy our remedial regard. The fissure itself, indeed, may in its formation have proved an actual advantage, rendering the concussion less intense and less hazardous than it might have been, had the ringing calvarium remained entire. The fissure may be short, and bounded by suture ; or it may traverse several of these, and be of great extent. It may take place at the part struck, or at the site of the contrecoup. It may be conjoined, or not, with rupture of the dura mater at the fissured part ; if it be so conjoined, compression by extravasation is likely to ensue. When the injury is situate at the base of the cranium, it is usually associated with such rupture, even when itself otherwise of a trivial character ; and extravasation occurring at this site, even to a slight extent, we have already seen to be of the gravest import.

The symptoms attendant on fissure are usually those of concussion, in the first instance ; and these may be followed by those of compression by extravasation. Inflammatory accession is not unlikely, giving the ordinary train of symp-

toms, according to the part and texture involved. And these, again, may be merged in the symptoms of compression by suppuration. If the injury be compound, the existence of fissure is ascertained by the finger or probe. If it be simple, the fissure may very probably elude detection ; the case being treated as one of simple concussion.

Long ago, it was the custom, in the treatment of this injury, to expose the fissure throughout its whole extent, by incision ; and to apply the trephine repeatedly in its course ; probably in the hope of liberating extravasated blood. But no one now thinks of thus aggravating what is in itself comparatively simple. It is time enough to take up the trephine, when symptoms of compression, by blood or by pus, are so plain and so urgent as to demand its use. It is not often, as already explained, that on the first count we are called upon to operate ; and, if we have seen the case from the first, it will probably be our own fault if we have to interfere on account of the untoward result of inflammatory action. The treatment is chiefly expectant. We await reaction from the effects of concussion ; watch the period when extravasation is likely to occur ; and, if need be, then interfere. That period of danger having passed, we are again quiescent, though alert ; looking out for symptoms of inflammatory accession ; and ready to oppose these with energy, should they appear.

Fracture at the base of the Cranium.

This is usually a mere fissure ; disruption, more or less extensive, without comminution or displacement. The fissure may either extend through previously compact bone ; or be a kind of diastasis—separation of the sphenoid from the temporal bones, for example, at the original points of union. As already stated, it is generally accompanied with laceration of the dura mater, and internal hæmorrhage ; and consequently is invariably attended with the greatest danger to life. The important parts of the brain implicated are almost certain to be compromised in function, sooner or later ; either almost immediately, by extravasation ; or by inflammatory action at a more remote period.

The injury may be occasioned in various ways. The head

may be crushed laterally ; as by being jammed between a wheel and a wall or post. Or, while the body is at rest, a severe blow is received on the vertex ; and the strain of the shock, communicated through the temporal bones, produces a splitting of those, or tears open the connexions with the sphenoid.* Or the body, falling, alights on the vertex ; and the spinal column, carrying both the weight and momentum of the body, is driven down upon the cranial base—the basilar process being probably broken through. Or, falling from a height, the patient alights on his breech, or on his heels ; and, again, a concussion, sufficient for disruption, may be so communicated to the cranial base. The extravasation is not always slight ; it may be great, one or more of the large venous sinuses having been torn ; then the symptoms are from the first most grave, and cannot but end fatally.

The circumstances which lead to a suspicion of fracture at the base of the skull having occurred, are : The kind of injury inflicted, such as already described ; symptoms of compression, early and severe ; escape of blood from the ears, nose, mouth ; discharge of a watery fluid from the ear, sometimes in considerable abundance. The last symptom is not immediate, but occurs after some days have elapsed. By some it is considered to denote escape of serous fluid from the sac of the arachnoid ; but by others it is contended that the phenomenon has been known to occur, when certainly that sac was not opened into ; by all it is held as a sign of most untoward import. Bleeding from the nose, mouth, or ear, following on severe injury of the head, is always suspicious ; more especially if the patient be found in a state of insensibility. But let it be borne in mind that such a combination of circumstances by no means certainly denotes the existence of fracture at the base ; the insensibility may be that of concussion or of intoxication ; the bleeding may proceed from

* "If a force be applied to the vertex, the superior border of the parietal bones resist displacement downwards, inasmuch as their inferior borders cannot be thrown outwards in consequence of their being supported laterally by the overlapping of the squamous portions of the temporal bones ; while the temporal bones, as M. Malgaigne has pointed out, are themselves supported by the zygoma, which constitutes on each side a true buttress, sustained by the superior maxillary bone. A shock, then, applied to the vertex, is directly transmitted to the temporal bone, and propagated through its petrous portions to the posterior part of the body of the sphenoid bone, the parts which most fractures of the base of the cranium traverse."—*Brit. and For. Med. Rev.*, No. 29, p. 174.

mere laceration of the schneiderian membrane and of the lining of the meatus, and from injury of the tongue by the teeth. When, however, we have such bleedings accompanied by urgent insensibility, obviously of the nature of coma; when the head symptoms either remain unimproved, or advance untowardly; and, more especially, when by and by the "welling of the ear" appears—we may safely conclude that fracture at the base has occurred.

The treatment must plainly be prophylactic and expectant, as already advised in the case of compression by inaccessible extravasation. There is no room for direct operative interference. If the compression be happily got over, we must then be very watchful of inflammatory accession. In all cases, prognosis is unfavourable; the majority prove fatal—either immediately by coma from extravasation, or more remotely from the effects of inflammatory action.

But it must be remembered, that fissure of the cranial base may have occurred, without any characteristic symptoms being evinced; the patient seeming to have laboured under mere concussion. The fissure may have been slight; and the solution of continuity may have been confined to the bone alone. The membranes remain entire; and there is no inward escape of blood. Compression, by extravasation, necessarily does not supervene; and inflammatory danger may be warded off by the ordinary care.

Ordinary Fracture, without Displacement.

The most common solution of continuity in the cranium, is not a mere fissure; but a fracture analogous to the comminuted fracture of the long bones; reducing the injured part to the condition of being broken up into one or more fragments; and these may or may not be displaced. When there is no displacement, the dangers to be apprehended are such as are common to other injuries of the head, apparently less severe; concussion; excessive reaction, bringing either compression by extravasation, or untoward inflammatory action; or a more insidious inflammatory process, occurring at a more remote period. The fracture may be simple, or compound, or with wound. The compound is, of course, of a more

unfavourable character than the others ; the dangers by inflammatory action being greater and more probable. But the difference is, on the whole, not so marked as between corresponding injuries of the bones of the extremities. It is possible that the existence of a communicating wound may often prove even an advantage ; by permitting outward escape of inflammatory or other effusions, and so saving the important internal parts.

The treatment is prophylactic and expectant ; according to the general principles already explained. There is as little necessity for immediate trephining, as in the case of mere fissure. If the injury have been sustained at the lower and anterior angle of the parietal bone, and is speedily followed by urgent compression, it may be advisable to apply the trephine in order to afford a freer vent for the meningeal hæmorrhage. But, usually, the aperture already existing is sufficient for an outward drain. And again, should symptoms of compression by suppuration supervene, at a more advanced period, operative interference may be necessary to effect a free evacuation. In general, however, there is no necessity for the use of the trephine.

Ordinary Fracture, with Displacement.

If the fractured portion, or portions, be displaced inwards, the brain is more or less incommoded, and symptoms of compression ensue ; proportioned usually to the amount of depression, and the relative importance of that part of the brain which is injured. The upper and anterior surface of the brain, as formerly stated, may bear a very considerable amount of compression with comparative impunity.

The injury may occur without corresponding wound of the soft parts ; but usually the fracture is compound.

The dangers are formidable. 1. By concussion. 2. By extravasation of blood. 3. By the results of inflammatory action on the brain and its membranes. 4. By compression, caused by the displacement.

The three first are to be opposed by fulfilment of the ordinary indications. The last is to be removed by operative interference. But in regard to this the question at once arises :

—Whether, in all cases of depressed fracture, operative interference, for the purpose of replacing the depressed portion of bone, is necessarily demanded? Formerly, the answer was in the affirmative; at present, it is not so. Elevation of the depressed portion is had recourse to, with two remedial objects in view; to remove the cause of compression, and consequently the symptoms of this, when they exist; and to remove a likely exciting cause of inflammatory action from the portion of cerebral tissue and membranes acted upon by the depressed bone. When the symptoms of compression are great and urgent, there is no room for hesitation; it is plainly the duty of the surgeon at once to attempt removal of the cause; fulfilment of the former of the two indications is sufficient warrant for recourse to the operation. But if symptoms of compression either do not exist, or are slight, and are recedent rather than gravescent, the case is very different. If we operate then, it is only to fulfil the latter indication; removal of the exciting cause of an apprehended inflammatory process. And then the question arises:—Whether the continued pressure of a smooth portion of depressed bone, or the injury and violence sustained by the parts in the performance of the elevating operation, is the more likely to excite an untoward amount of vascular action? Experience has answered to the effect, that the greater risk is encountered by recourse to operation.* And, consequently, the rule is, to refrain from operation in all cases of ordinary depressed fracture, in which symptoms of compression do not exist. Further: we know that the brain has the power of slowly recovering under a certain amount of pressure, even when that pressure continues undiminished. And, consequently, the rule of non-interference is extended also to those cases in which the symptoms of compression exist, but are by no means urgent, and seem to be slowly receding rather than on the increase. In young subjects, the call for artificial elevation must be especially urgent before it can with propriety be obeyed. For in them,

* Abundance of cases are on record, testifying the power which the brain has in bearing long-continued pressure, with comparative impunity, so far as inflammatory accession is concerned. One very remarkable instance is related by Sir A. Cooper, (*Lectures*, p. 128,) in which certain symptoms of compression endured for upwards of thirteen months, in consequence of the existence of depressed fracture; complete and almost instant recovery following removal of the depression by operation, at the end of that period.

it is to be remembered, a system of *mutual* accommodation may be said to be in progress ; the brain not only becoming accustomed to its altered circumstances, but the compressing agent being also gradually withdrawn—the bone, by its inherent elasticity, slowly re-approaching its former level. In the adult, there is not the same resiliency ; but then too something is done, on the part of the bone, to favour complete recovery of the functions of the incommoded organ. After some considerable time, the depressed portion is found to have become wonderfully smooth on its internal surface, and bevelled at its margins, by the action of the absorbents ; it does not cease to press, but now presses with all gentleness on the parts beneath.

In ordinary fracture with displacement, therefore, we do not interfere by operation, unless symptoms of compression not only exist, but are urgent. And in these cases, the operation may not wholly succeed ; the compression being perhaps by blood as well as by bone. In all other cases, we content ourselves with the expectant and prophylactic treatment, as if depression did not exist.

When the fracture is compound, comminuted, and depressed—that is, when fragments are not only displaced, but completely detached from the rest of the cranium—we of course do not hesitate, in all such cases, to remove the loose fragments, with gentleness and care, whether symptoms of compression exist or not.

Also, let it be understood, that when, in a case of compound fracture, with displacement, sharp fragments seem to be dangerously in contact with the dura mater—much more, if this membrane be penetrated or punctured by them—we ought as soon as possible to raise or remove the offending portions, whether head symptoms exist or not ; for in no other way can violent inflammatory accession be averted. And to effect this, the use of the trephine may or may not be necessary.

When operative interference is determined on, the indications to be fulfilled are sufficiently plain. To expose the parts, by suitable incision of the soft textures superimposed. To use the sound margin of bone, as a fulcrum, on which the elevating lever may rest. To insinuate the extremity of the lever beneath the displaced part, and to effect replacement with as

little violence as possible. For the insertion and working of the elevator, sufficient space may already exist. If not, this is to be acquired ; by gently lifting away a loose fragment ; or by removing a portion of the sound bone, by means either of the saw or of the trephine. After the operation, much antiphlogistic care must necessarily be maintained.

Punctured Fracture.

By the term "ordinary fracture, with or without displacement," is meant injury done by an obtuse body ; causing solution of continuity throughout the whole thickness of the bone ; and producing fragments composed of both tables of the skull, separated from their general connexion in nearly equal proportions. A smooth and uniform, non-penetrating, surface is consequently presented by the depressed portion to the brain and its membranes. But when a sharp-pointed substance—as the point of a poker or pitchfork, the corner of a spade, shovel, or hammer, or the angle of a sharp stone—impinges on and penetrates the cranium, the nature of the injury is very different. The external table is crushed by the penetrating body, to an extent proportionate to its lodgement. But the inner table, being much more brittle, gives way to a greater extent. It is broken up into fragments—usually small and spiculated—which, being driven inwards by the force of the blow, penetrate, or at least seriously irritate the coverings of the brain, producing inflammatory action. This may be general, involving the brain itself, and to the last degree dangerous ; or it may be limited to the injured dura mater, causing abscess there—a result still most perilous to life. And to accomplish the latter evil, it is not necessary that the fragments of the inner table should penetrate, or in any way mechanically injure the dura mater. It is sufficient that they are detached from the general cranium, and remain unremoved ; they necessarily die ; and, as sequestra, they inevitably become surrounded by purulent formation.

The rule of practice, then, comes to be plain. Whenever we are satisfied that punctured fracture has occurred—in other words, that the kind of fracture is such that splintering of the internal table is certain—we cannot too soon proceed to ope-

ration. We trephine immediately, so as to expose the fragments, and admit of their being carefully and efficiently removed. Unless they are removed, antiphlogistics are practised in vain ; inflammatory action becomes established at the part ; sooner or later abscess forms ; and then we find ourselves compelled to operate for relief of compressed brain, under very unfavourable circumstances. The least result is such abscess of the dura mater ; it may be, that even the questionable chance by operation is not afforded, the inflammatory action having proved general—cerebral, as well as meningitic—and speedily carrying off the patient. Taking the most hopeful view of the case, a necessity for operation is certain to arise, at some stage. Surely it is most prudent to operate, at that time which plainly is most promising of an auspicious result. Better to operate at once, removing the paramount exciting cause of undue vascular action, and probably averting all inflammatory casualties ; than to attempt, subsequently, to retrieve or limit danger and disaster, already sustained.

The rule as to operation, then, is very different in the case of punctured fracture, from what is applicable to any other injury, hitherto considered. We at once proceed to the operation of trephining, whether head symptoms, of any kind, are present or not. The mere existence of this form of injury is an amply sufficient warrant for our interference. Head symptoms, and those of a most urgent kind, are certain to supervene, if the operation be withheld. They can be averted only by early removal of the splintered fragments resting on the dura mater. After the operation, antiphlogistic treatment must be sedulously maintained.

As in the case of concussion, it may be difficult, at first, to persuade the patient—as yet suffering but little—of the propriety of instantly submitting to treatment which may seem to him unnecessarily severe, and indeed quite unwarrantable. This obstacle is to be overcome, by a calm yet earnest exposition of the certain danger which otherwise awaits him.

Obviously, it is our first duty to come to a just conclusion as to the existence or not of this kind of fracture. A most minute examination is accordingly made. The scalp is freely divided, if need be, to expose the fractured point to sight as

well as touch ; and by a gentle, yet determined, use of the finger and probe, we endeavour to satisfy ourselves thoroughly ; assisted in our decision by regard to the mode in which the injury has been inflicted.

Penetrating cuts of the Cranium—as by a sabre, axe, or sharp spade—often closely resemble punctured fracture, as to the kind of injury done to the inner table, and the immediate necessity for operation. When the cut passes sheer through both tables, the inner is usually splintered ; and the fragments press inwards, untowardly. They must be removed. The chasm of the wound is often sufficient to disclose their presence and site, to finger or probe ; and it may suffice for removal also. If not, room is to be made by application of the trephine.

Fracture of the External Table, alone.

This is not an uncommon result of comparatively slight violence done to the calvarium ; by bodies, either sharp or obtuse. The external table alone gives way ; and is perhaps driven inwards on the diploë. The accident occurs only in those of middle age, in whom diploë, with marked distinction between the cranial plates, exists. No operative interference is required. The treatment is, locally and generally, antiphlogistic. But, as formerly stated, inflammatory action may become excessive, and extend inwards ; suppuration in the diploë may lead to suppuration also on the internal aspect of the bone, necrosis of the implicated part ensuing. Under such circumstances, the operation of trephining is likely to be required, to relieve compression.

Fracture of the Inner Table, alone.

Fortunately this is of comparatively rare occurrence ; for, the outer table remaining entire, we have no means of ascertaining the nature of the injury, at the time of infliction. It may follow on a sharp concussing blow ; in a patient, who, by reason of age or other cause, has a vitreous table of unusual brittleness. The table may be simply severed, and not much

depressed ; then head symptoms are likely to prove both slight and transient. But, more probably, there is comminution as well as displacement ; and then the usual hazard is incurred from the depressed and perhaps penetrating spicula. The trephine is likely to be called for, after a time, on account of dura-matral abscess.

Depression without fracture.

As already stated, this occurs only in children ; in whom bones are more prone to bend than to break. A dimple is made in the skull, by external violence, and is slowly effaced by virtue of the inherent elasticity of the tissue. For a time, there may be symptoms of compression ; but seldom of a marked character ; and still more rarely urgent. Operative interference is neither necessary nor expedient. The treatment is simply antiphlogistic ; and prophylaxis is long maintained.

The operation of Trephining.

The Trephine is a circular saw, worked by a light and rapid movement of the hand, whereby a portion of the skull is divided, and may be removed. For its application, complete exposure of the bone is necessary. If a wound already exist, it is enlarged to the necessary extent. If there be no previous wound, a crucial or other incision is made, so that, by reflection of flaps, the required exposure may be effected. The pericranium is carefully removed, to an extent sufficient to admit of the free play of the instrument ; but no further. The centre-pin, sharp-pointed, having been made to protrude beyond the serrated edge, is securely fixed there by its screw. And then, by firm pressure, accompanied with a slight rotatory motion, the centre-pin is fixed in the bone, so as to steady the instrument in its first movements on the external table. The teeth of the trephine are usually set so as to work from left to right ; and it is well to have the crown fluted, on its lower half—this being found to favour its free play. The turnings are made steadily and rapidly ; with very light pressure, after the centre-pin has been fixed ; and the light

pressure is exerted only during the movement from left to right. When the sulcus has advanced to such a depth as is sufficient to retain the saw steady in the groove, the instrument is withdrawn, and the centre-pin is pushed back entirely ; to proceed with it still protruding, were not only to do what is unnecessary, but also to encounter much risk of injury to the dura mater at the latter part of the operation. The plain crown is reapplied, and worked steadily as before. There is no occasion for hurry ; the operation itself, so far as the sawing of the bone is concerned, is comparatively painless ; and, besides, it is usually undertaken while the patient is insensible. If diploë exist, a change of sound and feeling is imparted to the operator, intimating that the saw has passed the external table. Then the instrument is moved very warily ; and it is well to remove it from time to time, examining the sulcus with a probe or toothpick, to ascertain whether or not at any point section of the inner table may have been completed. If an aperture be detected, then the instrument, when reapplied, is inclined to the opposite side, and moved with increased caution and lightness. The want of parallelism in the two tables of the skull renders such precautions essential to the safe performance of the operation. Section having been completed at all points, the detached circle is to be removed. Perhaps it may come away in the crown of the instrument. If not, by the point of a lever, or by forceps, dislodgement is effected ; and the circle is gently withdrawn :—in this step of the procedure, as well as in the last of the sawing, much care being taken to avoid injury to the dura mater. If any rough or sharp points are found on the margins of the aperture, these are to be removed by the elevator ; otherwise, the dura mater might sustain injury.

When the operation is undertaken for the elevation of depressed bone, it is seldom necessary to remove an entire circle of bone. All that we desire is room sufficient for elevation of the depressed portion, and removal of fragments if need be ; and this can usually be accomplished by fixing the centre-pin on the brink of the sound bone, and so removing by the saw only a segment of the circle.

The operation, and the object for which it was undertaken, having been accomplished, the flaps are carefully replaced,

and the general wound is invested by tepid water-dressing ; care being taken that no undue bleeding takes place from the scalp ; and, in regard to this point, it is to be remembered, that vessels which do not bleed during the state of depression, may part with their contents freely on the establishment of reaction. Above the water-dressing it is well to place a few turns of a bandage, lightly applied—affording support—more especially when deficiency of the cranium happens to be considerable. The wound is treated in the ordinary way ; union taking place by the second intention. Of course, rest is absolute, severity of regimen is extreme, and antiphlogistics are held in readiness, for some considerable time after the operation. It has been proposed to replace the removed circle of bone, after completion of our object, in the hope of its becoming reunited ; but such hope has been proved vain, as was to have been expected.

When the wound has healed, the dura mater is found to have become incorporated with the soft parts exteriorly, and the breach in the cranium is not filled up by bone, but by dense membranous formation. A meagre film of new bone may be found at the mere margin of the aperture. And this, in time, extends centripetally ; apparently by the slow secretive action of the parent bone alone, the pericranium, dura mater, and other soft parts, seeming to be incapable of assuming ossific action. At the margin of the aperture the new bone may be of similar thickness with the cranium ; but, as it extends, it shelves rapidly ; becoming very thin as it approaches the centre. Many years are required, ere osseous reparation is complete. In consequence, it is expedient, for a long time, to guard the imperfect part from external injury ; a piece of leather or metal being worn over the cicatrix.

At one time, the operation was frequently performed ; on grounds much too slight. From the preceding remarks, the following brief deductions may be drawn, as to its present use. It is had recourse to, 1. On account of punctured fracture, as soon as possible ; whether head symptoms exist or not ; the object being to remove splintered fragments of the inner table. 2. On account of depressed fracture, accompanied with urgent symptoms of compression ; when elevation

of the depressed portion cannot otherwise be effected. 3. On account of dura-matral abscess, when local and constitutional symptoms sufficiently concur in pointing out the existence and site of this morbid state ; the object being to effect external evacuation of the pus. 4. On account of urgent compression caused by extravasated blood ; only when the circumstances are such as to indicate the seat of the extravasation, and when that happens to be accessible.

Occasionally, the surgeon has been called upon to trephine, in cases of epilepsy, in which the disease seemed to be connected—in the relation of effect and cause—with a depression of the cranium, the result of former injury ; or in which the circumstances seemed to point with much plainness to a certain spot of the cranium—perhaps the seat of internal enlargement, of either an obtuse or spiculated character. The operation, under such circumstances, is of doubtful expediency ; but may be performed, at the suspected spot, in obedience to the urgent entreaty of the patient and his friends.

In general, it is well to avoid applying the trephine in the direct course of the middle meningeal artery, or over the longitudinal sinus. Yet if it seem of decided importance that the instrument should be applied at such localities, the risk of hæmorrhage need not deter us. A compress of lint will readily restrain the venous bleeding ; and if a similar application fail to stanch the arterial flow, the osseous canal, in which the vessel is usually imbedded, may be temporarily plugged, by the insertion of a small portion of wood or cork.

Wounds of the Brain.

The brain may sustain an incised wound, as by a sabre cut ; a contused and lacerated wound, as by depressed fracture ; a punctured wound, as by the thrust of a bayonet, pike, or any other sharp-pointed weapon ; or a gunshot wound—of the class contused and lacerated—by the penetration of a bullet. The likelihood of disaster is grave and imminent ; by extravasation of blood, in the first instance ; by inflammation and its results, secondarily. The treatment requires to be proportionally watchful and energetic.

Incised wounds may simply penetrate, or partially detach

a slice of the organ. Such a flap is not to be at once removed ; but is to be replaced along with the corresponding investing textures, in the hope that reunion may occur. Examples are not wanting of a fortunate result.* Much care is necessarily required to ward off inflammation.

In contused and lacerated wounds, a certain amount of inflammation is inevitable. It is our business to moderate and control this, by the ordinary means ; and to prevent disorganization and protrusion of the cerebral tissue at the injured part.

In punctured wounds, inflammation is not inevitable—unless foreign matter lodge—yet it is very likely to occur. The antiphlogistic precautions require to be very rigid.

In gunshot wounds, the danger by inflammatory action is pre-eminently great. Not only is the wound of the contused and lacerated kind ; there is also great probability of lodgement of the bullet, or portions of it, or of fragments of bone, displaced and driven in. And it is well to remember, that the want of an apparently sufficient aperture of entrance is no sure proof of the ball having not penetrated and lodged ; for, in the young more especially, the inherent elasticity of the osseous tissue may be so great as to diminish the space of entrance-wound very considerably. Contusion and laceration of the cerebral tissue, and its investments, render a certain amount of inflammation inevitable ; the lodgement of foreign matter causes the amount and intensity of such action to be great and hazardous. And further ; foreign substances, penetrating deeply, are not unlikely to interfere with the most important portions of the organ—as at its lower and posterior part—producing death, either instantly, or at no protracted period, by direct interference with function.

Lodgement of Foreign Bodies.

When foreign bodies penetrate the brain, and their site of lodgement can be ascertained through the wound, the surgeon naturally becomes desirous of effecting the removal of so palpable an exciting cause of the coming inflammatory action—

* LARREY, *Clinique Chirurgicale*, tom. i., p. 140.

of the results of which he is so much in dread, and not without good cause. If the extraction can be effected easily, by forceps, probe, or hook, without much additional injury being inflicted on the cerebral tissue, it should certainly be attempted with as little delay as possible. If, however, the site of lodgement is unknown, or if the foreign body is found both difficult of access and firmly imbedded, it is better to abstain from the infliction of exploratory and evulsive violence ; which would be certain to kindle an amount of inflammation quite uncontrollable. It is better to withhold all direct interference ; contenting ourselves with busy antiphlogistics, to meet that amount of inflammatory action—perhaps amenable to control—which the infliction of the wound and the lodgement of foreign matter cannot fail to induce. We may happily succeed ; though the general prognosis is doubtless unfavourable. There are instances on record of bullets, lodged deeply in the brain, remaining there, harmless, for years ; incased in adventitious cysts—as happens in other textures. Such fortunate patients, however, require ever to be most careful in avoiding all inordinate excitement of the cerebral functions, and of the general circulation ; for it has happened, again and again, that—after years of immunity—a debauch, or violent emotion, has induced a sudden and fatal coma.

The rule of practice then is : That, while it is very desirable to remove foreign substances which have lodged in the brain, at as early a period as possible, in order that we may hope to contend more successfully with the coming inflammation—such removal is not to be attempted at the expense of further and serious injury to the cerebral tissue. Such additional injury will render the inordinate vascular action uncontrollable ; and the patient must perish thereby. Leave the part undisturbed, and trust to general antiphlogistics ; it is possible that the vascular action may be kept within moderate limits, and the patient may be saved.

Hernia Cerebri.

By this term is meant protrusion of the cerebral substance through cranial deficiency. To constitute this morbid state, three things are necessary ; deficient space in the cranium ;

a corresponding aperture in the membranes of the brain, by wound, ulceration, or sloughing ; disorganization of the corresponding portion of cerebral substance by inflammation. It is most likely to follow on compound and comminuted fractures of the skull, with depression of the fragments, and laceration of both brain and membranes. The pouting prominence first merely fills the cranial orifice ; it then shoots above it ; and, in no long time, it may attain to a considerable size. Now, probably, it becomes impacted in the cranial aperture, is strangulated there, and sloughs ; a fresh protrusion, however, takes place, and the progress is as before. Portion after portion of the upper part of the brain may be lost in this manner, without much apparent and direct injury to the cerebral functions ; but, sooner or later, the formidable constitutional irritation which accompanies will prove fatal ; and there is besides a risk of the disorganizing inflammation extending widely and fatally from the original site.

Prevention may be in our power. When the brain has been exposed by compound and comminuted fracture ; and when there is a deficiency of the cranium, by removal of the fragments, with or without the use of the trephine—the occurrence of cerebral protrusion, in consequence of inflammatory accession, is always to be apprehended. And two indications fall to be fulfilled. 1. To atone for the cranial deficiency, by affording uniform, steady, yet gentle support to the part, by compress and bandage ; renewing the dressing as often as cleanliness and propriety of management require. 2. By antiphlogistics, timely and efficient, to prevent and control the otherwise disorganizing inflammatory action.

An attempt to *cure* comprises a greater difficulty. The obvious indications are, to restrain the inflammatory action ; and to repress the exuberant growth. The former is to be fulfilled by antiphlogistic treatment ; but this must be most warily conducted, inasmuch as it is probable that, by this time, there is no tolerance in the system of severe remedies of that character. To fulfil the second, three means may be considered effectual ; pressure, ablation, escharotics. Pressure is to be preferred ; direct, accurate, steady, firm, but not severe—otherwise symptoms of compressed brain might be induced, with, not improbably, aggravation of the inflammatory action.

The hydrostatic pressure, as recommended by Dr. Arnot, may be found highly available. Ablation of the cerebral protrusion is not expedient, unless the protruded part be in a sloughy condition, when it must ultimately be lost ; or unless pressure, alone, have been duly tried, and found ineffectual. In either case, the protruding portion may be shaved smoothly off, by a knife, on a level with the cranial aperture ; and then the continued pressure is to be resumed. The use of escharotics is, in no case, advisable.

The true hernia cerebri consists of cerebral substance disorganized ; mixed with grumous blood, and other inflammatory products. Its formation is always a most unfavourable sign ; and the ultimate issue is seldom but unfortunate. The affection is sometimes simulated, however, by coagulum. A mass of clotted blood, mixed with inflammatory exudation, but containing little or no cerebral substance, may protrude ; presenting almost the same appearances as the true hernia cerebri. This is amenable to more summary treatment, and bespeaks a more hopeful issue—although usually a sign of active inflammatory action having seized on the part, and calling for a proportionate activity in antiphlogistics. The projection is at once removed, by knife or fingers ; and firm occupying pressure is applied to the cranial aperture.

Paracentesis Capitis.

Puncture is sometimes had recourse to in otherwise hopeless cases of hydrocephalus. It is easily effected ; by plunging a fine trocar, or grooved needle, through the bregma—free of the longitudinal sinus. After a few ounces of fluid have escaped, the instrument is withdrawn, the aperture is closed, and moderate support by compression is applied. By repetition only, at considerable intervals, is the procedure likely to prove successful.

CHAPTER IV.

DISEASES OF THE SCALP AND CRANIUM.

Erysipelas of the Scalp.

THIS disease may be idiopathic ; and then it is usually of a mild character, so far as the intensity of the local action, and its effect on texture, are concerned. It is very apt to supervene on wounds ; more especially if numerous dragging stitches have been unwisely used to effect approximation ; and, still more especially, if these stitches have been allowed to work their own way out by inflammation and ulceration. And such untoward accession to scalp wounds is much favoured, by ungenial conditions of the atmosphere at certain seasons ; as well as by previous derangement of the primæ viæ, or habits of intemperance on the part of the patient. If the phlegmonous form occur, danger to texture is great ; by diffuse infiltration, both above and beneath the tendinous expansion of the occipito-frontalis ; and the constitutional symptoms are proportionally urgent.

The chief peculiarities of erysipelas of the scalp, in a practical point of view, may be considered to be ;—the unfavourable nature of the parts, on account of the presence of hair, for suitable treatment of the minor examples ; the unfavourable nature of the parts, on account of the presence of a large amount of tendinous expansion, for safe progress of the more grave forms of the disease ; and the dangerous propinquity of the affected part to an organ of the greatest importance, which is ever liable to suffer—either by extension of the inflammatory action, or by metastasis.

Treatment.—When erysipelas threatens to seize upon the scalp, either directly, or by extension from the face, it is our first duty to have clean abrasion of the hair effected, so that the necessary measures may be fully in our power when the accession does occur. In the case of extension from the face, the disease is usually of the simple character, and limited

to the skin. And it is well to attempt to turn it from its upward course, by placing a guard by means of nitrate of silver, (*Principles*, p. 140,) while time and space still permit. For cure, punctures, with hot fomentation, usually suffice, in addition to the ordinary constitutional management. Cold, or other repellents, must never be employed; they may be grateful to the sensations of the patient, at the time; but the risk by metastasis is overwhelming. Even the application of nitrate of silver to the erysipelatous part is scarcely advisable; for a similar reason. Especial regard must be had to the interior of the head, both during the progress of the disease, and for some days after the apparent decline. For, it has not unfrequently happened, that convalescence has been suddenly—and perhaps ruinously—interrupted, by inflammatory re-accession, not in the part originally affected, but in the membranes of the brain.

If the phlegmonous form declare itself in the scalp, and the dangerous infiltration have already begun, we cannot too soon make the requisite incisions, (*Principles*, p. 288,) in those parts which plainly demand them from the experienced observer. At first the knife need not pass beyond the sub-integumental adipose tissue, for the action has, as yet, gone no deeper; but, if, from neglect or otherwise, infiltration be already subtendinous, the knife must pierce tendon too; otherwise the invariably aggravating tension cannot be relieved; the pain will increase greatly, and the inflammatory fever will rise higher; matter will burrow rapidly over the pericranium, and perhaps beneath it also; and the action will extend widely,—perhaps involving the cranial contents, in at least a minor form. Timorous incision through the tendinous expansion, is the only means whereby such extreme mischief may be mitigated; but it is surely better practice, by an earlier and less extensive wound, to prevent all such casualties; effecting recedence of the action, while it is yet limited to its original site, the skin and subintegumental tissue. When burrowing of matter has taken place beneath the tendinous expansion, it is not necessary to lay the track open throughout its whole extent; but only, by the formation of a dependent opening—with a suitable counter-opening, if need be,—to prevent purulent accumu-

lation, and to afford the parts an opportunity of effecting reunion by granulation. To assist in this indication, uniform support by bandaging is very useful, after the acute stage has passed by.

When the scalp has been undermined by pus, even extensively, it does not follow that it must necessarily slough, in any part of the undermined portion. Its vascular supply is not so dependent on the subjacent cellular tissue as is that of ordinary integument; the course of the ramifications of the occipital and temporal arteries being rather cutaneous than subcutaneous; and the isolated skin—bearing its own vessels—consequently retaining its supply of blood but little impaired.

Aware of the dangers of erysipelas of the scalp, it is plainly our duty in the management of all wounds of the head—however trivial they may at first seem to be—to avoid everything, in part and system, calculated to induce an undue amount of vascular action; more especially if, by previous indisposition, or sinister atmospheric influence, the patient seem to be predisposed to erysipelatous accession.

Eruptive diseases of the Scalp.

Under the general terms of Porrigo, Tinea, or Scaldhead, a variety of eruptive diseases are included; which are naturally divided into those of the vesicular, pustular, tubercular, and squamous characters:—thus,

I. *Vesicular.*—II. *Pustular.*—III. *Tubercular.*— IV. *Squamous.*

Vesiculæ	{	<i>Eczema</i>	{ <i>Eczema simplex</i> , acute and chronic. <i>Eczema furfuracea</i> - Porrigo furfurosa. <i>Eczema amiantacea</i> .	
		<i>Herpes</i>	{ <i>Herpes circinnatus</i> - Ring-worm. <i>Herpes zoster</i> .	
Pustulæ	{	<i>Impetigo</i>	<i>Impetigo sparsa</i>	- - Porrigo favosa.
			<i>Impetigo granulata</i>	- Porrigo granulata.
			<i>Impetigo eczematosa</i>	- Porrigo larvalis.
Tubercula	{	<i>Favus</i>	<i>Favus dispersus</i>	- - Porrigo lupinosa.
			<i>Favus confertus</i>	- - Porrigo scutulata.
Squamæ	{	<i>Pityriasis</i>		
		<i>Lepra</i> and <i>Psoriasis</i> , rare.		

Most authors agree in stating the probability that none of these affections are truly contagious, except Favus ; but it is well, in treatment, to act warily in this matter—approaching error, if at all, on the safer side.

Eczema simplex.—Heat and tension occur in the scalp, followed by redness, and the appearance of a vesicular eruption. The vesicles are small, pointed, and closely set together ; and occur in patches. They are not pierced by the hairs, but placed intermediately. The fluid is at first clear, then milky. When the vesicles give way, the effused contents mat the hair together, forming thin yellowish crusts, adherent to the hair. These crusts separate from the scalp, as the hair grows ; ultimately drying, and crumbling down. The ears, usually, are similarly affected with the scalp. The affection may be either acute or chronic ; and either form is a common attendant on dentition. The constitution is always more or less involved. The disease may occur at all ages, but is most frequent in childhood.

The acute form requires little save cleanliness, and mild antiphlogistics. During dentition, no repressive remedies should ever be employed ; nor should the affection, at such a period, be rashly interfered with in any way, excepting to effect soothing and palliation ; the eruption seeming often to be a natural mode of relief from serious and internal disorder. The hair is cut close. Shaving is unnecessary, and indeed inexpedient—proving very painful, and adding fresh excitement where there is already too much. Fomentation is used—medicated or not, as circumstances may seem to demand—and light poultice, or water-dressing, is applied intermediately ; the diet is sparing ; the bowels are regulated ; and, in the child, the gums are looked to.

When the chronic form refuses to yield to simple means, gently stimulating washes are to be employed ; as :—the sulphuret of potass—a drachm, or two drachms, to a pint of water ; or carbonate of potass, in similar proportions. Failing these, more potent remedies may be used :—iodide of sulphur, in the form of ointment—from twelve grains to half a drachm, to an ounce of lard ; or nitrate of silver, or sulphate of zinc, in strong solution. But let such remedies be used

cautiously ; not too frequently, nor of undue strength ; their object is to change, not to aggravate the vascular action. The head should be as loosely covered as possible. It is customary for the patient to wear an oil-skin cap—conveniently retentive of dressing, and savouring of cleanliness ; but apt greatly to retard the cure, by maintaining congestion in the scalp, as effectually as if this part were covered by a constant and warm poultice. Its use is therefore reprehensible.

Eczema Furfuracea.—Numerous thin scales appear on the scalp ; yellowish, and opaque ; either dry and loose, or moist and adhering to the hair. They result from the desquamation of vesication ; and prove dry or moist, according as the discharge ceases, or is maintained, after the vesicle has given way. The affection may either occur in patches, or involve the whole scalp. It is attended with considerable itching.

Eczema Amiantacea often follows the preceding. Masses of white pearly scales form, adherent to the roots of the hairs ; ultimately matting the hair together, and giving the head a white, striated, glistening appearance, like coarse asbestos.

The *Eczema furfuracea*, and *E. amiantacea*, are to be regarded as but varieties of Chronic Eczema. They partake both of the vesicular and of the squamous character ; beginning with the one, and ending with the other. They may occur at any age ; but are most frequent in children. The treatment required is as for obstinate chronic eczema simplex ; the state of the general system being invariably much attended to.

Herpes, in any form, is of comparatively rare occurrence in the scalp. *Herpes Circinnatus*.—This is the true “ Ringworm ; ” but more frequently found on the neck, shoulders, chest, and face, than on the scalp. Annular clusters of small globose vesicles form ; sustained on an acutely congested base ; encircling a portion of apparently sound skin ; disappearing by desquamation ; and usually of constitutional origin. At first, the treatment is mainly constitutional ; the local management is soothing and antiphlogistic. Then the nitrate of silver is applied, in solution ; at first weak, afterwards varied in strength according to circumstances.

Herpes Zoster is of very rare occurrence in this situation.

The characteristic vesicles occur on one side of the scalp, and terminate abruptly at the median line. The same treatment is required as in the other variety of the disease.

Impetigo Sparsa.—Psydracious pustules form in the substance of the skin, preceded by erythema and itching; either single, or in small detached groups; usually, they are most numerous towards the vertex and posterior part of the head. The pustules burst; and the discharge concretes, forming thick crusts of a rich yellow colour, glistening, semi-transparent, adherent, and permeated by hairs. Ultimately they desiccate, and become lighter in colour though opaque; then either crumbling down, and passing away, or uniting to form a continuous incrustation. The neighbouring lymphatic glands sometimes become the seat of inflammatory action, and may suppurate. If cleanliness be not scrupulously attended to, foetor becomes great, and pediculi are numerous. On detachment of the crusts, a red shining integument is exposed, devoid of hairs; but the baldness, in all forms of *Impetigo*, is only temporary.

Impetigo Granulata.—Achorous pustules form; small, isolated, and of a light yellow colour; never congregated; and each independent pustule is usually found traversed by several hairs. The fluid of the pustule is not like the pus of *Impetigo sparsa*, but is thin, and dries quickly. By desiccation small brownish scabs are formed, which gradually enlarge by addition; and each scab is pierced by a hair, to which it tightly adheres. Some of the scabs remain attached to the scalp; others separate, and become strung on the hairs like beads; and, by this time, they have become hard—resembling grains of sand, or portions of dirty mortar. If cleanliness be not attended to, the odour becomes very offensive, and pediculi multiply; the latter, indeed, are seldom absent, and may be classed as a characteristic feature of the disease.

Impetigo Eczematosa.—Thin scabs follow achorous pustules, which occur in clusters, and are combined with vesicular formations. They are preceded by considerable swelling, redness, heat, pain, and itching; and usually occur about the temples and fore-part of the head. Pediculi are not want-

ing, generally ; but are neither so numerous nor so characteristic, as in the preceding form. There is more itching, however, than in any other affection of the scalp. The face is not exempt ; and when this is the seat of the disorder, the term *crusta lactea* is usually applied. As this phrase implies, the disease is most common in young children.

Impetigo usually occurs about the periods of first and second dentition ; and regard must always be had to this circumstance in the treatment. By many it is supposed to facilitate this usually painful and tedious process ; or, at all events, to avert more serious disorder which the protracted irritation of dentition might otherwise induce. It is not to be checked. But, in the first instance, we content ourselves with palliatives and attention to cleanliness. Only when the disease proves long-continued and troublesome, do we interfere with an avowedly curative object in view. The indications of treatment are—1. To remove the hair ; so that the irritation of this may prove no hindrance to healing. As already stated, short cutting, by scissors, is preferable to abrasion by the razor. 2. To remove the scabs. This is effected by fomentation and poultice. 3. To remove the inflammatory action ; by fomentation, or hot water-dressing, purgatives, mild antimonial exhibition, and careful regulation of diet. Leeching, if necessary, may be practised behind the ear. 4. To change the action. For this purpose, various lotions are applied. And that which seems to obtain most favour is an aqueous solution of the sulphuret of potass, in the proportion of from one drachm to three drachms to a pint of water ; applied four or five times a day. When itching is troublesome and obstinate, a few drops of the hydrocyanic acid are to be added. If addition of the acid fail to afford relief, creosote, diluted, may be tried. At the same time, an occasional or even daily use of Harrogate salts—yet not so as to produce purging—is found to be of advantage. And during the fulfilment of this indication, diet is nourishing, but non-stimulant. A fifth indication might be added ; urging the propriety of attending to the state of the general system, throughout the whole period of cure.

Favus Dispersus.—Yellow, dry tubercles form ; either

singly, or in small groups ; at first very small. They seem to originate in the hair follicles ; and appear to be inserted into rather than placed on the skin ; by some, the yellow matter is supposed to be true tubercle. The size is gradually enlarged ; and a circular form is attained, with a central depression, through which a hair protrudes. The odour is peculiar, resembling somewhat that of the urine of a cat. Pediculi are numerous ; and besides the itching which these loathsome creatures occasion, a dull sensation of tightness is felt in the head, probably on account of pressure being made on the true skin by continued accumulation of the favous deposit in the follicular cavities. Ultimately the hair falls off ; and permanent baldness remains.

The disease may occur at any age ; but is most common in young persons. It may extend from the scalp to other parts of the body ; and is most decidedly contagious. Frequently—perhaps, generally—it seems to be connected with the scrofulous diathesis. Indeed, it is never found primarily to attack the healthy. Very commonly the lymphatic glands of the neck enlarge ; they are liable to suppurate ; and the opening which results displays the usual characters of the scrofulous sore.

Examination by the microscope shews the tubercular matter productive of numerous vegetations—mycodermata.*

Favus Confertus merely differs from the preceding variety, in the extent and form of the deposit ; which occurs not in isolated tubercles, but in continuous patches. Oval or round spots of baldness result ; temporarily covered, chiefly towards the circumference, with the favous crusts. Such patches unite ; and thus, ultimately, the whole scalp may be permanently depilated. Usually, however, a fringe of hair—of a monkish character—remains around the periphery. The constitutional symptoms are, in general, more marked in this variety. In either form of favus, a chronic inflammatory process sometimes becomes established beneath the crusts ; matter forms ; and troublesome ulcers may ensue.

The predisposing cause of favus would seem to be a deteriorated state of system, ordinarily of the scrofulous charac-

* *Microscopic Journal*, Dec. 1841.

ter ; either induced or aggravated by the effects of infantile disease, bad diet, exposure to weather, insufficient clothing, and inattention to cleanliness. The exciting cause is, probably, in most cases, the direct application of favous matter. Hence it can be readily understood how the disease affects the poorer classes mainly.

The indications of treatment are:—1. Cleanliness, and clearance of the scabs. This is effected by cutting the hair short, poulticing, and using a solution of the chloride of soda. 2. The hair is removed altogether. Sooner or later it must fall out ; and it is well to effect the shedding early, so that the irritation of the stumps may not interfere with the return of the follicles to a normal condition. Depilation used to be effected by a pitch-cap ; by which application the hairs were entangled and rudely extracted. Afterwards, evulsion by pincers was supposed to be a mitigation and improvement. At present, the object is obtained by gentler means. Alkalies are found to have the effect of removing the hair radically ; without pain or other inconvenience ; and are used in the form either of solution or of ointment :—as one drachm of carbonate of potass, to an ounce of lard ; or from two drachms to three drachms of the carbonate of potass, to six ounces of water ; or soda may be substituted for the potass ; and lime, too, is found to be available to the same end. The application is used morning and evening ; and by the use of a fine comb, on alternate days, the hair is brought easily away. 3. A change of action is to be effected. And many applications are used for this purpose. The sulphuret of potass, in stronger solution than for impetigo ; carbonate of potass, in solution, continued after depilation—perhaps in increased strength ; the nitrate of silver, in solution—from ten to twenty grains to the ounce of water ; the fluid nitrate of mercury, diluted so as not to prove escharotic ; iodine, in either aqueous or alcoholic solution—from one scruple to two scruples to the ounce ; iodide of sulphur, from ten to twenty grains to the ounce of lard. 4. Cleanliness is maintained, and desquamation of the morbid matter favoured, by daily ablution of the head with brown soap and water. 5. Constitutional management is not forgotten ; the general

character of the treatment being such as is found best calculated to oppose the strumous diathesis.

Pityriasis Capitis.—Numerous, dry, greyish scales are found scattered among the hairs ; scarcely preceded by vascular excitement. “Scurf,” in short, is unusually abundant. If eczema supervene, then its discharge mingles with the scales ; and the eczema amiantacea is probably constituted.

Aperient alteratives, such as the Harrogate salts, are given internally. The scalp is washed, often with water and soap, and occasionally with a weak solution of the sulphuret of potass. The hair is worn short ; and soft brushing is frequently employed. No irritating ointments or lotions are required.

Alopecia.—This term denotes mere baldness ; in patches, or continuous. It may be the result of a primary affection of the hair bulbs ; or be but the sequela of some other disease of the scalp—vesicular, pustular, or tubercular.

Primary alopecia is said to be of three kinds. 1. That which is dependent on atony or atrophy of the hair bulbs. Old age, or any other cause of general debility, induces this. Sometimes it follows habitual pressure on certain portions of the scalp. Sometimes, the imperfection would seem to be congenital. It may be either partial or general, temporary or permanent, according to the nature and intensity of the cause. 2. Alopecia folliculosa, dependent on a morbid condition of the hair follicles, is of comparatively rare occurrence. “It is characterized by the presence of circular or oval patches of variable extent, somewhat elevated above the surface of the surrounding scalp, and of a greyish, pink, or dull purple colour ; thickly studded with a number of small papillæ, that give a rather rough feel to the part affected, the hairs covering which are always broken off at a distance of two or three lines from the surface of the skin.” It occurs chiefly in children, and appears sometimes to be contagious. 3. Alopecia circumscripta, the porrigo decalvans of Willan, may occur at any age. Smooth, shining, bald patches form suddenly in the scalp ; the skin presenting its normal cha-

racter. The occurrence is preceded by no eruption, or other sign of vascular excitement. The baldness may remain; or the hair grows again, thinner, and of a lighter hue, than before.

Senile baldness is of course incurable. But when the constitutional debility is of a transitory nature, or when the atony is entirely local, much may be done by treatment. The general system is rectified, as far as circumstances will allow. The hair is kept closely shaved around the bald portions; and the piliferous bulbs there are roused to a better action by the rubbing in of stimulating applications; as the tinctura capsici, tinctura cantharidis, &c.

Secondary baldness, when following favus, is incurable. When resulting from any of the other eruptive diseases of the scalp, it is amenable to the same treatment as primary baldness, when the original disease has been subdued.*

Tumours of the Scalp.

Encysted tumours, commonly called Wens, are found more frequently on the scalp than in any other situation; and they are seldom single. The only advisable mode of treatment is removal by the knife. The main danger to be encountered is excess of vascular action, assuming the erysipelatous character; and this must accordingly be provided against by suitable constitutional treatment, as well before as after the operation, and by gentle and careful management of the wound. If the tumour be of large size, it is removed by regular dissection. By two elliptical incisions, of merely subcutaneous depth, the redundant integument is detached; and then the cyst, carefully preserved entire and tense, is leisurely dissected from its connexions, and taken away along with the portion of sacrificed integument. The flaps of saved skin are then reponed; and on oozing of blood having ceased, they are brought into accurate contact; the wound being treated with the hope of adhesion. Approximation is effected by strips of the isinglass plaster; and to facilitate the applica-

* This account of the Eruptive Diseases of the Scalp is chiefly derived from Mr. Erichsen's excellent treatise on that subject.

tion of these, the surrounding scalp has been previously shaved. Stitches are neither necessary nor advisable. If the tumour be no larger than a nut, or small egg, it is unnecessary to remove any integument; and regular dissection is therefore not required. A more summary process suffices; that by incision, extrusion of the contents, and evulsion of the cyst. (*Principles*, p. 573.) If an encysted tumour, in a patient advanced in years, have inflamed and suppurated, and be in process of intractable ulceration, it is well to destroy the part effectually, either by escharotics or by excision—the latter method the preferable; for malignancy of action is apt to be assumed.

Solid tumours, of various kinds, are occasionally found in this locality. Of these, the most common is the adipose; seldom of large size; and amenable to the ordinary treatment—excision. Of whatever nature the tumour be, its removal should be early; ere incorporation has taken place, either with the scalp above, or with the fibrous textures beneath.

Erectile tumours very frequently occur in the scalp. They are best treated by deligation; with, or without previous reflection of the integument, according as this happens to be involved or not in the morbid structure. (*Principles*, p. 473.) The very large tumours of this class, sometimes met with on the side of the head, are not to be tied all at once, but in portions; different parts being strangulated at different periods. Experience has proved that, in such cases, deligation of the main arterial trunk, or trunks, is an insufficient remedial means, and that attempted excision is fraught with the utmost danger to life.

Malignant tumours occasionally form in the scalp; following the usual course; and amenable to the ordinary treatment. Benefit is to be expected only by free excision; and that can be practised with expediency only at an early period. Medullary tumours may commence in the soft tissues, and involve the hard secondarily; fully as often, they originate in the bone.

Malignant ulcer of the scalp is not uncommon; beginning as a warty excrescence; or the result either of an originally simple sore, or of an open and degenerate encysted tumour.

Early and free removal is had recourse to ; if the lymphatics as yet present no contra-indication.

Pericranitis.

The pericranium becomes the seat of the inflammatory process, with or without external injury having been applied. Acute action may be the result of wound or bruise ; following the ordinary course of such action in fibrous tissues. Or acute and suppurative action may extend from the surface ; as in erysipelas of the phlegmonous form. The usual antiphlogistic indications require to be fulfilled.

The idiopathic pericranitis is more frequently chronic than acute, and seldom occurs but in the adult, who has sustained injury of the system by mercury and syphilis—one or other, or both. The ordinary symptoms are present, of pain, swelling, heat, tightness ; and the nocturnal exacerbations are peculiarly marked. The affection may resolve, leaving little or no structural change ; or the resolution is incomplete, an enlargement of bone remaining—resembling a diffused node. Or true inflammation is established ; and the bone suffers, to a greater or less extent, by ulceration, caries, or necrosis. Usually the periosteum of other bones is at the same time and similarly affected ; and the bones most likely to suffer along with the cranium, are the clavicles, sternum, tibiæ, and ulnæ.

The treatment is mainly constitutional. The primæ viæ having been brought into a tolerably satisfactory condition, a sustained exhibition of the alteratives well known to be suitable to such cases is proceeded with—sarsaparilla and iodide of potassium, either together or alternately. The latter, more especially, is found to be highly available. Locally, leeches and fomentations are applied, at first ; then, counter-irritation. The inflammatory process having been removed, and its results only remaining, nothing is found more beneficial than the endermoid use of a strong solution of iodine. Throughout the whole period of cure, the hair is kept either shaved or short. Atmospheric exposure is carefully avoided ; and regimen is most rigidly non-stimulant. If matter form acutely, it must be evacuated, freely and early. If the ab-

cess be chronic, opening is delayed, and discussion by iodine attempted. Even when rough and spongy bone can be plainly felt through the chronic collection of pus, the iodine should still be persevered with—along with the internal use of iodide of potassium—when the affection is dependent on a constitutional cause ; for, in such cases, discussion is not unlikely to follow patient perseverance, even under circumstances by no means promising. Should, however, acute or subacute accession supervene, the abscess becoming tense and crescent, let incision be no longer delayed.

In obstinate examples of pericranitis, causing mere change of structure, with slight swelling but great pain, the general health is apt to give way greatly, from want of sleep, and consequent exhaustion. In such cases it is essential to give opiates ; and if the more proper alteratives have proved ineffectual, mercury may be given, in the form of a solution of the bichloride, and in guarded doses, (*Principles*, pp. 310, 311.)

Affections of the Cranium.

Abscess and ulcer of the cranium, occur from the ordinary causes ; and are amenable to the ordinary treatment.

Caries of the skull is always preceded and accompanied by interstitial absorption ; and seldom occurs but with a vice of system—seeming to be rather a symptom and sign of this, than to constitute a disease in itself. And the predisposing vices of system are,—scrofula in the young ; mercurio-syphilis, or the ill effects of mercury alone, in the adult. The treatment, accordingly, is chiefly constitutional. Locally, the diseased structure is exposed ; and removal of the carious surface is effected by escharotics—chloride of zinc, or red oxide of mercury. (*Principles*, p. 330.) Sometimes Nature is provident in this matter ; and herself effects the necessary clearance ; the useless parts coming away spontaneously, as small sequestra. If the whole thickness of the cranium be involved, there is of course additional danger, by dura-matral involvement ; and precaution requires to be exercised accordingly. Sometimes, unfortunately, a triumvirate of scrofula, syphilis, and mercurialism reigns in the system of the miserable patient ; and then, as can readily be understood, the local affection proves particularly intractable.

Necrosis may involve the whole thickness of the skull; the result of wound or not—usually the former. Then, as already stated, there is risk to life by purulent accumulation between the bone and dura mater; and, if no external aperture already exist—as by fracture—the use of the trephine is demanded.

Exfoliation, or death of the external portion, is more frequent; the result either of external injury, or of chronic idiopathic pericranitis. The usual course of superficial necrosis is followed, here as elsewhere. Ordinarily, we await patiently the spontaneous separation, and then remove the sequestrum. Sometimes, when detachment is tedious, acceleration may be effected by the application of escharotics. (*Principles*, p. 351.) And sometimes it is necessary to interfere and forcibly elevate the dead portion, which, though separated from the hard textures, is yet confined by the soft granulating structure around. (*Principles*, p. 351.)

In all forms of necrosis of the cranium, the ordinary formation of cortical and substitute bone does not occur. And how fortunate such an arrangement is, at once becomes apparent, when we consider what would be the inevitable consequence of new bone bulging inwards on the dura mater. If the sequestrum have been superficial, the healing is effected by a depressed cicatrix, as after simple ulcer of bone. (*Principles*, p. 324.) When the whole thickness has perished, atonement is made for the deficiency as after the operation of trephining.

As in the case of caries, many examples of exfoliation of the cranium are dependent on the mercurio-syphilitic vice of system; and require constitutional treatment accordingly.

In connexion with the traumatic form, it is well to remember that detachment of the periosteum—even rudely and with some bruising of the bone itself—does not render the occurrence of exfoliation inevitable. (*Principles*, p. 334.) The part may, and frequently does, recover. And the treatment, in the first instance, is to be conducted with a view to such a result; the flap of integument being carefully replaced, the wound approximated, and speedy healing sought for.

Exostosis of the cranium is not uncommon; of a dense, ivory character; and usually of small size. Fortunately the site of growth is on the external aspect of the bone. No treat-

ment is required. The affection is a mere deformity ; and not even that, unless apparent by want of capillary covering.

Tumours of the calvarium—osteosarcoma, and osteocephaloma—are rare ; more especially the true osteosarcoma. When they do form, no treatment, save mere palliation, is advisable. The site and connexions of the affected part forbid operative interference.

CHAPTER V.

AFFECTIONS OF THE ORBIT, AND ITS CONTENTS.

I. AFFECTIONS OF THE ORBIT.

Orbital Inflammation

Is usually the result of injury, when primary. Sometimes it is of a secondary character, and unconnected with violence done to the part ; an extension of inflammatory action from a neighbouring part—from the eyeball, or from the scalp. Most frequently it follows injury. And the action is usually intense ; suppuration being certainly and soon attained. Pain is great and increasing ; tension is great, for the necessary swelling is hindered by the unyielding process of the periosteal lining of the orbit—termed the orbital ligament—which confines the orbital contents in front ; vision is more or less impaired by compression of the eyeball, and this organ, according to the amount of deep swelling, is more or less protruded ; the eyelids are red and œdematous ; inflammatory fever is intense, and the cerebral functions are often prominently disordered.

The treatment comprises the ordinary antiphlogistic indications. When a wound exists, careful examination is expedient, to ascertain whether or not any foreign substance—as straw, wood, iron—has penetrated and lodged ; and if such an obvious exciting cause of inflammation be detected, it is to be forthwith removed. Leeches are applied in numbers ; in most cases, general blood-letting will also be found advis-

able; and the antiphlogistic accessories to blood-letting—antimony, purgatives, quietude, &c., will not be neglected. The part is diligently fomented; and so soon as indications—however faint—exist, of matter having formed, an evacuating incision is practised; it being obviously of the greatest importance to penetrate the orbital ligament at an early period of the suppuration. On evacuation of the matter, the symptoms are speedily mitigated; the tension, throbbing, and intense pain, almost immediately. If incision be delayed or omitted, spontaneous evacuation takes place; but not till after much suffering, considerable destruction of texture, and dangerous impairment of function in the eyeball.

Wounds of the Orbit.

These are usually of the punctured kind. As just stated, they are liable to prove the exciting cause of intense inflammation, more especially when there is lodgement of foreign matter. And the probability of the latter circumstance must always be regarded in practice. The wound having been ascertained to be free from foreign matter, is carefully approximated; and cold is continuously applied, with much care, in order to avert inflammation, if possible, and secure union by adhesion. If inflammation supervene, the antiphlogistic treatment must be early and active; a suppurating wound is then inevitable; but we hope to avert deep and confined abscess, which is prone to form by extension of the inflammatory action beyond the wound's track.

But such injuries acquire a still higher importance, in reference to the parietes of the orbit. A penetrating wound of the orbit—as by a bayonet, pike, or pitchfork—is not unlikely to produce fracture of the orbital plate; and the fragments of the broken bone, driven inwards, are certain to penetrate or otherwise injure the brain or its membranes; endangering life, perhaps immediately, by extravasation of blood—more probably by the results of inflammatory action at a more remote period. Such wounds, therefore, require to be treated with the greatest caution. The extent of injury done to the bone is ascertained as soon, as accurately, and yet as gently as possible. If loose fragments are

found to exist, these it is well to remove ; the external wound being dilated, if need be, for this purpose. And when the spicula are certainly displaced inwards, injuring the important parts in that direction, an attempt should be made to take them away ; whether they seem detached or firm. The indication is as paramount, as in punctured fracture of any other part of the cranium. This important part of the treatment having been satisfactorily accomplished—by dilatation of the external wound, and the suitable use of fingers, forceps, and probe—the patient is placed on his face, with the wound unapproximated, until bleeding cease ; internal extravasation being thus rendered less likely to occur. Then the parts are brought together ; and antiphlogistics are diligently employed, both locally and generally, in order to avert, if possible, an untoward amount and extent of the inflammatory process.

Tumours of the Orbit.

Hard Tumours of the orbital parietes are uncommon. The dense ivory exostosis produces little inconvenience, is usually of inconsiderable size, and requires no treatment. The cancellated exostosis—of a pedunculated character, and larger dimensions—may incommode the eyeball. If so—the nature of the case being plain—an incision may be made on the origin of the growth ; its neck may be cut by the bone-pliers ; and, by careful dissection, the offending substance may then be removed.

The Soft Tumours are of more frequent occurrence. And they may be practically divided into three classes. 1. The simple and sarcomatous ; amenable to excision. 2. The erectile ; capable of cure, but not by direct operation. 3. The malignant ; usually forbidding operation, and admitting only of palliation.

1. The simple tumours—simply sarcomatous, fibrous, fatty, cystic—may form in the orbital cellular tissue, unconnected with either the bone or its periosteum ; and the growth may be either of idiopathic origin, or a remote consequence of slight injury. Enlargement is slow, gradual, comparatively painless, and unattended with inflammatory signs ; not likely therefore to be mistaken for orbital abscess. As in the latter

affection, however, outward growth is prevented by the orbital ligament; compression of the eyeball follows; and this organ may be more or less protruded from its socket. At first, sight is not lost, and scarcely even impaired; for the stretching of the optic nerve is gradual; and nervous as well as cerebral tissue has a very considerable power of accommodating itself to displacing agencies gradually applied. Ultimately, however, the stretching and displacement are attended with more or less impairment of vision.

By careful inquiry into the history of the case, we satisfy ourselves that the tumour is of the simple kind. Of what exact species it may be, it is not easy to determine; for the tense orbital ligament stretched over the swelling obscures the ordinary results of tactile examination. Generally, however, we are able to satisfy ourselves on another point; whether or not the tumour is movable—connected or not with the bone and periosteum—consequently removable or not, entire, by operation. When convinced that the tumour is simple and movable, we do not hesitate to attempt its extirpation. A wound is made of sufficient extent, in a line parallel to the fibres of the orbicularis muscle. By cautious dissection, the tumour is reached and exposed. It is then laid hold of by a volsella, or hooked forceps; and, by evulsion outwards being steadily yet gently maintained, extirpation is rendered both more easy and more safe. The point of the knife is moved very warily, when near, or in contact with the orbital parietes; for these, by the pressure of the tumour, may have been much attenuated; and a careless movement of the instrument might effect penetration. The eyeball and optic nerve are also carefully avoided. After removal of the tumour, the former is carefully reposed; and restoration of its functions usually ensues. The wound is brought together, and treated for adhesion.

Partial removal even of the simplest tumour, in this situation, is obviously inexpedient. For, reproduction will almost certainly occur, from the portion which remains. And such second formations are very apt to prove of an unfavourable kind.

2. The Erectile tumour is occasionally found occupying the orbit. The morbid formation is seldom congenital; but

occurs suddenly, in after life ; and its origin is usually attended with a considerable amount of pain. At first an obscure deep swelling is found, causing more or less inconvenience ; but as it enlarges, and approaches the surface, the ordinary characteristics of the morbid erectile tissue become sufficiently apparent. Often the cheek is covered with large veins—the recipients of the blood from the more active vessels within. This tumour cannot be treated directly ; neither knife nor ligature are advisable. Yet, if no remedial means be adopted, the probable issue will be unfortunate ; by enlargement, ulceration, hæmorrhage ; by involvement of the orbital parietes, and subsequent pressure on the brain ; or by mere constitutional irritation. Experience has shown that deligation of the corresponding carotid is equal to the effecting of a cure ; not by obtaining consolidation and obliteration of the dilated vessels ; but, probably, by diminishing their supply of blood, removing the impulse of the heart's action, and so favouring resumption of the normal calibre. And free blood-letting, after the operation, would seem to contribute materially towards this result. (*Principles*, p. 474.)

3. Tumours of a malignant kind—medullary—are no unfrequent occupants of the orbital cavity. Generally they originate in the eyeball : but occasionally this is involved only secondarily—the origin being in the orbital cellular tissue, in the periosteum, or in the bone. The only hope of cure is by extirpation of the whole orbital contents. And this is expedient, only when the disease is recent, apparently limited to the soft parts, and probably capable of entire removal.

II. AFFECTIONS OF THE EYELIDS.

Injuries.

Ecchymosis is of frequent occurrence in the eyelids ; the cellular tissue being lax and delicate. Ordinarily it is the result of bruise, by blow ; but it may follow wound, more especially if oblique or subintegumental ; and the application of leeches is almost certain to produce it, to a greater or less extent. It is important as a deformity. A patient, having received an injury likely to be followed by ecchymosis, is

anxious that this should be prevented ; and, the escape of blood having occurred, he is equally anxious that the discolouration should be removed. Many remedies are popularly in vogue for both of these ends. For the former, the continuous application of cold by wetted lint, with quietude and abstraction of all stimuli, is both suitable and easily obtained : If begun immediately on receipt of the injury, and properly maintained, the natural hæmostatics will be much favoured, and very probably little or no blood will escape from the torn vessels. Ecchymosis having occurred, the nature of the application must vary according to the presence or not of inflammatory action in the part ; in the one case, fomentation is employed, subjugation of the morbid vascular action being the paramount indication ; in the other, a solution of the muriate of ammonia, or other sorbefacient, is applied, in order to hasten removal of the extravasated blood by absorption.

Wounds of the eyelids, if contused, are treated by the water-dressing. If incised, approximation is effected by fine sutures ; other retentive means being plainly inapplicable to this locality. And much care is taken to restore the normal relative position with accuracy, lest deformity ensue.

In the case of burns, much precaution is required during the process of healing ; lest by contraction ectropion supervene.

Foreign Bodies.

Foreign bodies of small size—as particles of sand, dust, glass, coal—very frequently lodge in the eyelids, on their conjunctival lining. The patient, suffering much pain and irritation—with the eye already red, intolerant of light, and profusely lachrymating—applies for our aid on account of “ something in his eye.” Gently opening the eyelids, before a steady light, we scrutinize the eyeball in the first place ; directing the patient to roll the organ in various directions, in order to facilitate such examination. If particles are found adherent, they are in general easily removed ; by a curette, or flat end of a probe ; by a hair pencil ; or by a fold of a soft handkerchief. If fine dust only have lodged, fomentation and

ablution will ordinarily suffice ; assisting the lachrymation in its spontaneous extrusive effort. Sometimes it may be necessary to insert a gentle stream of tepid water, by means of a small syringe. In other cases, it is enough to shut the eye, or keep it shut, for a few minutes—occasionally blowing the nose ; thus favouring the natural washing away of the foreign particles, by the increased lachrymal and conjunctival secretion, and consequent escape at the inner canthus. The eyeball having been duly scanned, the lower eyelid is next examined ; its conjunctival lining being readily exposed to a sufficient extent, by simple depression of the part. But the upper eyelid is the site most frequently occupied by the foreign substance ; and it cannot be sufficiently exposed, without eversion. This is effected by placing a probe horizontally across the lid, above its cartilage ; taking hold of the eyelashes with the finger and thumb ; and bending the eyelid backwards. If the foreign matter be loose, it is removed by any of the means already mentioned. If it be firmly lodged, the point of a fine lancet, or of a couching needle, will most conveniently effect its dislodgement.

In certain occupations, particles of steel or iron are apt to get between the eyelids, and often become impacted in the cornea. When loose, they may sometimes be brought to the surface and removed, by means of a magnet of strong power ; but generally the point of a couching needle is required to effect their detachment.

When no assistance is at hand, the patient may himself, in many cases, get rid of the irritating matter ; by elevating the upper eyelid with the fingers of one hand, and pulling it downwards, while he at the same time closes the lower. Having pressed gently over the globe, the finger is then withdrawn, and the lids allowed to separate. The eyelashes of the lower lid are thus made to sweep the conjunctival lining of the upper ; and it is in the latter situation, as already stated, that foreign bodies of small size usually lodge.

Clearance having been effected, the eye is closed ; light is excluded ; and antiphlogistics, actual or prophylactic, are employed, according to circumstances. It is plain that, if the foreign substance be not removed, inflammatory action will certainly be established, and probably prove untoward and intractable. Cases are not wanting in which complete de-

struction of vision has been the ultimate result of but a small particle of foreign matter lodging in the conjunctival lining of an eyelid ; perhaps with much injury done to the system, by severe and sustained treatment directed against the inflammatory action and its results.*

Blepharitis.

The inflammatory process, attacking the eyelids, is so named. It may follow injury ; assuming the ordinary character and course, and amenable to the ordinary treatment.

In erysipelas of the face, the affection of the eyelids is usually a most prominent symptom ; the laxity of their cellular tissue admitting of much and unseemly swelling. Punctures are usually necessary ; not so much to abstract blood, as to evacuate the serous effusion. After recession of the primary symptoms, this part must be closely watched ; for, during convalescence, reaccession of inflammatory action is very apt to occur, advancing rapidly to suppuration. (*Principles*, p. 280.) And unless an early incision be made here, the abscess will be large, and the integument will probably slough.

Ophthalmia Tarsi.

By this is meant a congestion, or chronic inflammatory process, affecting the eyelids ; more especially at their margins. The meibomian follicles are prominently affected ; and viscous, disordered secretion adheres to the parts, tending to cause cohesion of the ciliary margins. Lachrymation, besides, exists ; more or less. The eyelashes are stunted, or deficient. Itching, heat, and intolerance of light, are usually present ; and the general expression is bleared and unpleasant.

The disease will usually be found co-existent with some vitiated condition of the general system ; and to that the treatment must be mainly directed. Not unfrequently, the constitutional vice will be found of the scrofulous character. If pain, heat, and redness, and other ordinary characteristics of the inflammatory process exist at all prominently, blood is to be taken away sparingly from the part, by scarification of

* *Lancet*, 1061, p. 435. One among many.

the conjunctiva, or by leeches at the inner canthus. For a few days afterwards, fomentation, medicated or not, anodyne-ly, is applied. Then stimulants are used; solutions of zinc, or nitrate of silver; or the ung : nitratis hydrargyri, diluted. In obstinate cases, counter-irritation is useful; and this is best effected by the application of blisters behind the ears. In children, the state of the gums and teeth must be looked to.

An advanced form of this chronic affection of the eyelids is sometimes termed *Lippitudo*. The ciliary margins are red, thickened, everted, and denuded of hair; and the eye seems to be girded by an angry red circle. The general expression is consequently very unpleasing; and the patient's discomfort is also great. Local and general alteratives are pre-eminently required; but they often fail to prove quite satisfactory.

Not unfrequently, ophthalmia tarsi is but a part of a more general affection of the eye, of a strumous character.

Hordeolum.

By Hordeolum, or *Stye*, is meant a circumscribed inflammatory swelling, which may either remain of an indolent and indurated character, or advance to suppuration. In the latter case, discharge takes place, and discussion slowly follows. Very frequently the affection originates in a meibomian follicle, and resembles an ordinary pimple. The follicle is obstructed, and its contents accumulate; an inflammatory process is then kindled in the perverted part, suppuration takes place, and the enlarged follicle becomes the seat of a small acute abscess.

Here, too, the general health will be found amiss; and purgatives, alteratives, and regulation of diet will probably be required. While the swelling is nascent, fomentation and light poultices, or water-dressing, are suitable. When matter has formed, a puncture should be made at the apex of the swelling, for efficient discharge. Water-dressing is again applied. And if a chronic hardness should threaten to remain, discussion of this will be promoted by pencilling the part lightly over with a solution of iodine.

An inflammatory swelling, similar to the true hordeolum,

may form in the ordinary cellular tissue of the eyelid ; resembling a small furunculus. It is amenable to the ordinary treatment.

Small, hard swellings, of a whitish colour, very superficial, painless, and almost stationary, occasionally form beneath the integument of the eyelid. According to their size, they are termed either *grando* or *milium* ; according as they most resemble a piece of hail or a millet-seed. Causing deformity, they require removal. A scratch is made through the thin skin stretched over them, and the white pearly-looking substance is ejected. No escharotic is necessary. The wound scarcely bleeds, and heals simply.

Warts sometimes form on the eyelids. They may be taken away by knife, ligature, or caustic.

Encysted Tumours of the Eyelids.

Encysted tumours are of frequent occurrence in this situation ; more especially in the upper lid. They are usually of small size ; the contents are white and glairy ; the cyst is extremely delicate. Their site may be either subcutaneous or submucous ; on the conjunctival or on the external aspect of the tarsal cartilage. The majority of the patients are of the female sex.

Removal by regular dissection need not to be attempted : the cyst is too delicate. And, for the same reason, incision, with evulsion of the cyst, is inapplicable. It is sufficient, in some cases, to incise the part, to extrude the contents, and with the flat end of a probe to disturb and break up the tender cyst. But, in most cases, it is well to apply an escharotic, so as to ensure the cyst's destruction, and consequent non-reproduction of the tumour. The nitrate of silver is very suitable ; escharotic enough to annihilate the cyst ; and not likely to cause such loss of substance as would delay the cure, extend the cicatrix unnecessarily, or risk the occurrence of either inversion or eversion of the lid by contraction of the cicatrix. Incision is facilitated by effecting previous tension of the part. And this is done by simply stretching the skin over the swelling, and cutting through the attenuated integument ; or by everting the lid, and then cutting through the stretched and prominent mucous membrane.

Either form of procedure is the preferable ; according as the site of the tumour happens to be subcutaneous or subconjunctival.

Hypertrophy of the Upper Eyelid.

The upper eyelid is occasionally affected by hypertrophy of both its integument and mucous membrane. The swelling is considerable, and causes deformity ; it also obstructs vision ; and there is an unpleasant puriform discharge.

By two elliptical incisions, a sufficiency of the diseased integumental texture is removed ; and the wound is approximated by suture. The conjunctival change is subsequently remedied, by scarification, followed by the use of sorbefacients. Or, should the conjunctiva resist this gentler means, partial ablation of it may be practised as in the case of the integument.*

Cancer of the Eyelids.

Malignant ulceration usually is preceded, in the eyelids, by warty formation. The only cure is by excision ; early and free. If the disease be limited, sufficient removal may be effected, yet without deformity or exposure of the eyeball ; the wound being so shaped as to come well together by suture. But when the disease is extensive, and operation warrantable, the prevention of deformity need not enter into our thoughts. One paramount indication is present—removal of all the diseased part. That must be effected, at whatever sacrifice of texture. And when it has been found necessary to remove the whole or greater part of the eyelids, on account of malignant ulcer, it comes to be a question whether or not it be politic to spare the eyeball—supposing it to be apparently sound. If it be left, two events are likely to occur ; one certainly ; the other probably. From want of protection, after removal of the lids, the conjunctiva becomes cuticular, and the eye grows white and sightless. And, very probably, not only is the organ found deprived of

* LISTON, *Lancet*, 1839, p. 489.

function, and rendered useless ; it also becomes the seat of a return or extension of the original disease. It is better, then, to anticipate ; and to remove at once, along with the eyelids, that which is certain to become of no use, and which, if spared, will too probably invite return of what we are seeking to root out and destroy.

Intractable ulcers of the eyelids—not malignant—are best treated by regard to the state of the system—more especially of the digestive organs ; and by occasionally touching the parts with the fluid nitrate of mercury. Sometimes they are of a syphilitic character ; obviously dependent mainly, for cure, on constitutional treatment.

Closure of the Eyelids.

By the term *Anchyloblepharon*, is understood, union of the eyelids at their tarsal margins ; congenital ; or accidental, the result of cicatrization after burn or scald. When congenital, the cohesion is seldom to a great extent ; occupying only the angles. No interference may be deemed necessary. When more extensive, causing not only an unseemly deformity, but likewise interfering with vision, separation of the preternaturally united parts may be readily effected by incision. And, afterwards, all necessary means are taken to prevent reunion. Each lip of the wound is made to cicatrize separately, by granulation. When the closure is complete, a fold of the parts should be first raised from the ball, and cut through in a horizontal direction ; through this aperture a director is carefully introduced ; and on this the subsequent division to the angles is safely effected. The accidental form is amenable to similar treatment. But greater care is necessary, in the after management, to avoid reunion ; by interposition of dressing, frequent movement of the parts—and, if necessary, by forcible separation of the lids by plaster or even suture.

By *Synblepharon*, is meant adhesion of the eyelids to the eyeball ; seldom congenital ; usually the result of cicatrization after injury. In some cases, the cicatrix is dense and contracted ; admitting of no attempt at cure. In others, the adhesions are comparatively slight, and there is suffi-

cient laxity of texture. In these latter, the lids are to be liberated by careful dissection ; and their separate cicatrization is afterwards carefully tended.

Lagophthalmos.

Lagophthalmos, or Hare-eye, means an inability to close the eyelids ; congenital or not ; sometimes dependent on spasm of the levator palpebræ superioris ; sometimes caused by paralysis of the orbicularis muscle ; sometimes the result of cicatrices. There is something more than mere deformity. For, the eye, by exposure, becomes irritable, may inflame, and may subsequently undergo change of structure.

For spasm, antispasmodics are suitable ; more especially applied directly to the part. If these fail, subcutaneous section of the implicated muscle may be had recourse to. For paralysis, friction, electricity, strychnine, are appropriate. For faulty cicatrization, the knife may be required, to liberate texture, and restore relative position. In the congenital form, there may be a deficiency of texture, rendering the case scarcely remediable.

Ptosis.

Ptosis is a falling downwards of the upper eyelid ; producing no inconsiderable deformity, and seriously interfering with vision. It may constitute a disease of itself ; existing *per se* ; or it may be but a symptom of serious affection of the brain. When original, it may depend on debility of the elevating muscle, or on superfluity of the integument ; or it may be connected with both of these circumstances.

Redundancy of integument is easily got rid of, by removing a sufficient portion, either by knife or by scissors. Atony of the muscle may be overcome by stimulant friction, the passing of electricity, or the endermoid use of strychnine. Ordinary means having failed, an operation may be had recourse to. A portion of integument is removed from the eyelid, and also from a corresponding portion of the eyebrow ; the two raw surfaces are then brought into apposition, by suture, and made to adhere.

Care is taken to make this artificial elevation sufficient to clear the pupil and admit of vision. And a certain degree of motion may also be imparted to the eyelid, by rendering it amenable to the play of the fibres of the occipito-frontalis.

In the secondary form, dependent on affection of the brain, treatment must of course be directed to the cerebral disease.

Trichiasis.

This denotes an inversion of the eyelashes, whereby much irritation is induced on the surface of the eyeball. The mal-adjustment may implicate the whole cilia, or only a few. It may occur in either lid; but is most frequent in the upper. The position of the eyelid itself is not altered. At first there is merely inconvenience; but, sooner or later, an inflammatory process is established on the surface of the eyeball, and consequent hazard to vision may prove great.

The treatment is either palliative or radical. The former consists in evulsion of the erring cilia, from time to time, and mitigation of the irritation and inflammatory action which they may have occasioned. For evulsion, a fine sight and fine forceps are required; for the hairs are usually both slender and light coloured. The assistance of a lens is often necessary. This method is on the whole unsatisfactory; and is only applicable to those cases in which but a few of the cilia are in fault.

To effect a radical cure, it is essential that the lashes be not only removed, but that their non-reproduction shall be ensured. One of two methods may be followed. The errant cilia may be plucked out, and their bulbs destroyed. Or the bulbs and cilia both may be removed by cutting instruments. The former method is applicable to the partial Trichiasis; the latter to the complete. If the former be chosen, the eyelashes are carefully plucked out by forceps, and into the exposed bulbs a finely pointed escharotic is then carefully inserted so as to destroy the part. Or the bulbs may be punctured, and the escharotic applied, previous to evulsion of the hairs. The escharotic weapon may be a needle point, dipped in powdered tartrate of antimony, or coated with nitrate of

silver.* When it is our object to remove not only the cilia but their bulbs, the margin of the lid is laid hold of and stretched by the fingers of the left hand, or by forceps ; and by the stroke of scissors, or the sweep of a fine bistoury, the requisite amount is taken away. On cicatrization, the ciliary margin is found void of eyelashes, and consequently imperfect ; but at the same time the eyeball is found freed from irritation.

By *Distichiasis* is understood, a row of supernumerary cilia, growing inwards, and causing the same unpleasant and untoward results as in the foregoing affection. The anormal range is seldom complete ; and the hairs are invariably slender and light coloured. The same treatment is required as for *Trichiasis*. But more careful examination is expedient ; inasmuch as the observer is apt to be deceived by seeing the ordinary eyelashes of their normal character ; and, even when the lid is raised and scrutinized, the paucity, slimness, and paleness of the stray lashes may cause them to be overlooked ;—a serious matter ; for, unless they be noticed and removed, inflammatory action will not only become established, but will prove uncontrollable. In Mr. Liston's museum, there is, or used to be, a preparation, consisting of four or five delicate eyelashes, which not only cost the patient her sight, but were the cause of ruin to her constitution—through fruitless antiphlogistics.

Entropion.

This is a turning in, not only of the eyelashes, but of the margin of the eyelid itself, attended with all the unpleasant consequences of *Trichiasis*, in an aggravated form. It may be temporary or permanent. In the former case, it is the result of inflammatory swelling of the eyelid ; “the tumefied conjunctiva pressing out the orbital edge of the tarsus, while its ciliary margin is turned inwards by the action of the orbicularis.” When permanent, it may depend on relaxation of the integument of the lid, whereby displacement inwards of the ciliary margin is both permitted and favoured ; or on

* *Edinburgh Monthly Journal*, April 1841, p. 259.

contraction of a cicatrix on the conjunctival aspect of the lid, whereby the ciliary margin is directly pulled inwards ; or on a perverted form having been assumed by the tarsal cartilage itself, in consequence of ophthalmia tarsi, psorophthalmia, or other chronic disease. Either eyelid, or both, may be affected.

It is evident that treatment must be both early and suitable, if we wish to save the eyeball from serious injury. In the temporary form, it will be sufficient to oppose the inversion by the application of retracting plasters, until the cause of displacement has been removed, by treatment directed towards subjugation of the inflammatory process and dispersion of its swelling. In the permanent form, operative interference is essential. If the integument be redundant, a portion is to be removed. And it is necessary, that, in the first instance, a very careful examination be made, to determine how much is to be taken away so as to ensure rectification of the position of the eyelid, while yet we avoid removing an unnecessary amount, and so causing an opposite maladjustment of parts—ectropion. A horizontal fold is pinched up by suitable forceps, or by two common forceps, or by the fingers, and is removed by either knife or scissors. Bleeding having ceased, the wound is approximated by suture, and adhesion follows. Escharotics may be employed for the same purpose ; but are plainly inferior to the cutting instruments, being possessed of no certainty as to the amount of texture to be destroyed. A similar operation will similarly avail for benefit, when the inversion is dependent on a conjunctival cicatrix ; the internal contraction being counteracted by one which is external ; nicety, however, is plainly required in effecting the due adjustment. When the disease is dependent on a perverted state of the ciliary margin and tarsal cartilage, one of two methods may be adopted. The cilia and their bulbs may be removed by incision, as for Trichiasis ; care being taken to leave the puncta lachrymalia intact. Or, by such an operation as the following, an attempt may be made, retaining the eyelashes, to liberate and restore them to their normal position. “The patient having been placed in a sitting posture, and the head supported by an assistant, the inverted lid is separated from the globe of the eye by means of

the finger or a sharp hook ; and then with a pair of strong scissors, two perpendicular incisions are made through the tarsal cartilage, each about a quarter of an inch in length, the one upon the temporal, the other upon the nasal side, avoiding the punctum, and including the whole inverted portion of the lid. This part being now everted, and held in that position, the two perpendicular incisions are connected by a horizontal incision upon the conjunctival surface, close to the ciliary margin, by means of a scalpel ; cutting through the conjunctiva and tarsal cartilage, and leaving the inverted portion of the margin united to the rest of the lid merely by the integument. And especial care is taken that the knife does not penetrate through the skin." Water-dressing is applied. And "the success of this operation depends in a great measure on the edges of the incision being prevented from uniting by the first intention, particularly the horizontal incision upon the conjunctival surface. This is effected by everting the lid occasionally during the first few days, and by touching the edges immediately after the operation with the sulphate of copper, so as to cause them to suppurate and heal by granulation."*

Ectropion.

Ectropion denotes an opposite condition of the eyelid ; its eversion. The conjunctival lining is exposed, the eyeball is partially denuded, and much deformity is produced. After a time, the exposed palpebral conjunctiva loses much of its membranous character ; the surface of the eyeball becomes irritable, inflames, and undergoes change of structure—probably fatal to vision ; and a degree of epiphora invariably exists, in consequence of the natural course of the lachrymal secretion towards the puncta being interrupted. The malposition most frequently results from contraction of cicatrices of the integument ; and these may exist in the eyelid or its immediate vicinity, in the corresponding cheek, or extensively on the face and neck as after severe burns. The lower eyelid is the more frequently affected. The cicatrix may follow burn,

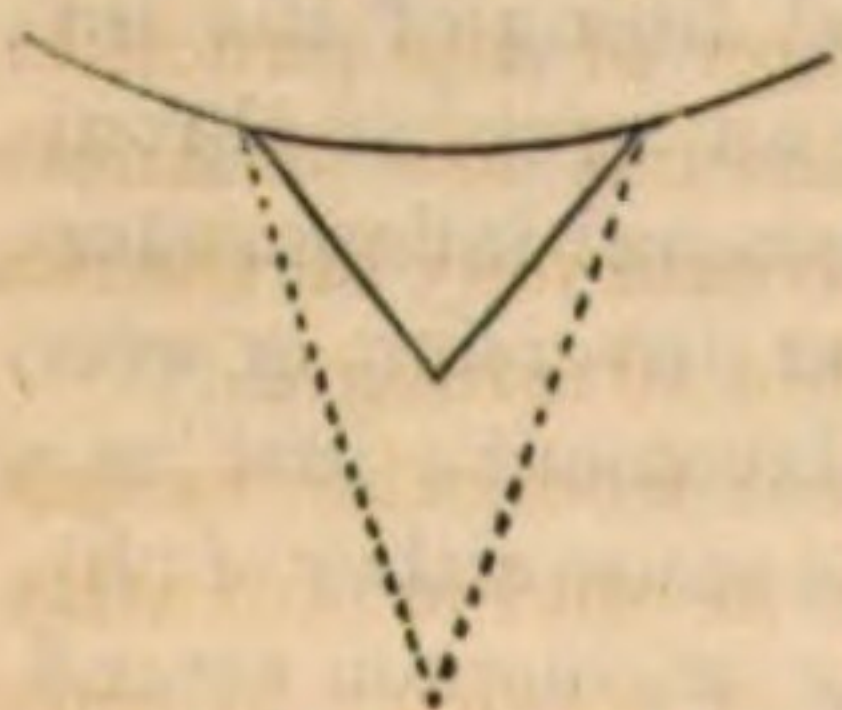
* *Dublin Medical Press*, July 27, 1842, p. 54.

wound, sloughing abscess, or exfoliation ; the first and last are the most unfavourable.

Ectropion, however, arises from other causes than the contraction of sores. Simple relaxation of the lower lid will produce it ; and this may depend on flabbiness and redundancy of all the component textures, or on paralysis only of the fibres of the orbicularis. The last circumstance is no uncommon occurrence in old people. Frequently Ectropion is caused by a faulty condition of the conjunctival lining of the lid ; which is the seat of swelling, of either an acute or chronic kind. And it is well to remember, how general inflammatory swelling of the lid is able to cause either inversion or eversion, according to the accident of displacement ; just as a similar condition of the prepuce may be the cause either of phimosis or of paraphimosis. Eversion is no uncommon attendant on purulent ophthalmia ; from the acute and great swelling of the lid, more especially of its conjunctival lining. It also results from an indolent enlargement and thickening of that membrane. The accidental division of either canthus, too, may cause it ; the lid becoming loose and pendulous.

The treatment necessarily varies according to the nature of the cause. Acute swelling of the eyelid and its lining is subdued by the usual means. Chronic enlargement of the membrane is first treated by scarification, and astringents. And if these be resisted, the redundancy may be removed, either by cutting instruments, or by caustic ; the former obviously to be preferred ; great care being taken lest, by the ablation of too much, entropion be produced. Atony or paralysis of the fibres of the orbicularis may be combated by the usual means ; but, generally, this form of the affection, occurring in those of advanced years, may be regarded simply as one of the many signs of decay, and irremediable. When there is elongation of the tarsal cartilage, or redundancy of the whole lid, abbreviation, sufficient to restore normal position, is effected by a simple operation. Towards the centre of the lid, a portion of its whole thickness is included between two sloping incisions, in the form of the letter V ; and the included part having been removed, the margins of the wound are brought together by suture. In the case of faulty cicatrices, the procedure is more difficult and less promising.

Occasionally, the simple division of a tight adhesion may suffice for liberation and replacement. But generally, there is loss of substance connected with the cicatrix, and consequently simple incision proves inadequate. In the case of a moderate cicatrix, at some distance from the ciliary margin, amendment, if not complete restoration, may be effected as follows: Supposing the lower eyelid to be affected, a V



wound is made, through the integument only, the apex pointing to the cheek. By means of the knife's point, the included skin is freed a little from its cellular connexions; and resilience upwards is favoured by the necessary manipulations. Displacement upwards is then definitely secured, by bringing together the wound that remains beneath, by means of sutures. In not a few cases, there are no sufficient laxity of parts to admit of this. Under such circumstances, something may be done by incising the eyelid, and replacing its ciliary margin; then filling up the chasm beneath, which necessarily results, by a flap of integument borrowed from the adjoining cheek. When Ectropion has resulted from accidental wound at the canthus, rectification is easily obtained by reunion of the divided parts; the margins of the cicatrized wound being made raw by paring, and retained in accurate apposition by suture.

Blepharoplastics.

When either eyelid has been partially, or totally destroyed, by injury, or by disease not of a malignant kind, an attempt may be made, not without good prospect of success, to supply the deficiency by a suitable flap brought from the immediate vicinity. No precise rules can be given for such an operation; the details must necessarily vary in each case.*

* *London and Edinburgh Monthly Journal*, 1843, p. 359. *Cyclopedia of Practical Surgery*. Sub voce.

III. AFFECTIONS OF THE LACHRYMAL APPARATUS.

Epiphora.

Simple Epiphora, or watery eye, may result from obstruction of one or both of the puncta lachrymalia. And this obstruction may be either congenital, or the result of injury or disease. It is simply remedied by dilatation of the punctum, by means of fine probes; and the occasional use of Anel's syringe, whereby a gently stimulating stream may be thrown into the canaliculi, is often of considerable advantage.

But a tear may habitually wet the cheek from other causes. The lachrymal fluid may be secreted in undue quantity. Then an astringent collyrium may be of service; in some cases, perhaps, local depletion, followed by counter-irritation on the temple, may be expedient in the first instance. The lachrymal sac may be in a state of atony; then stimulating injections or collyria are indicated. The nasal duct may be obstructed; then measures must be taken to effect a clearance. Or the watery eye may be but a symptom of a general ophthalmia; to be removed by subjugation of that major ailment.

In all cases of Epiphora, not prominently connected with some more important affection of the eye, the state of the general system must be carefully looked to; for it is extremely probable that no slight declension from health will be found; and, unless this be remedied, all local treatment will prove of comparatively little avail.

Xeroma denotes an opposite condition; a dryness of the eye, dependent on deficiency of the lachrymal secretion. It often is a temporary prelude to graver affections of the eye, of an inflammatory nature. When it occurs singly, and persists—as is but seldom—restoration of the secretion is to be courted by ordinary stimulant means.

Inflammatory Affections of the Lachrymal Sac.

The cellular tissue over the lachrymal sac sometimes is the seat of an inflammatory process; while, in the first instance,

the sac itself is free. A red, itchy, painful swelling exists at the corner of the eye ; and the system sympathizes slightly. The cause usually is exposure to cold. Purging, and antimony internally, with low diet, and pencilling of the affected part with nitrate of silver, will ordinarily suffice to obtain resolution. If they fail, then local depletion by leeching must be had recourse to ; the leeches not being applied to the part itself, but to its vicinity—otherwise erysipelas is very likely to ensue. It is obviously of much importance to be early and active in such treatment ; so as, if possible, to prevent involvement of the lachrymal sac. If suppuration should occur, a very early incision should be practised ; lest perforation of the sac take place. Not unfrequently, notwithstanding every precaution, the sac is involved, and suppurates acutely. The same treatment is necessary ; an early evacuating incision, or enlargement of the spontaneous opening ; and light water-dressing afterwards. The opening granulates and heals ; and usually the breach in the sac closes, leaving the cavity unoccluded.

The Lachrymal Sac may itself be the seat of the acute inflammatory process. This may occur idiopathically in those of weak system ; or in any one, after exposure to cold. A small, hard, circumscribed, and very painful swelling is formed beneath the tendon of the orbicularis muscle ; the superimposed integuments soon become red ; the eyelids are more or less oedematous : the corresponding side of the nostril is dry ; and the system sympathizes considerably. The swelling increases, often almost obscuring the eye ; and severe headach usually is complained of. The course of the tears is obstructed, by the tumid state of the duct's lining membrane ; and they find their way over the cheeks. The superficial effusion and exudation may prove resolute of the morbid process. Or suppuration occurs ; and, sooner or later, the matter is discharged externally. Then a slow recovery may ensue ; the nasal duct becomes again open, the tears resume their proper course, the suppurated aperture granulates and heals. Or, the obstruction in the nasal duct remains, the tears do not reach their wonted outlet, the aperture contracts but does not heal ; and the condition of fistula lachrymalis is established. In severe and neglected cases—more especially

if occurring in a debilitated frame—the subjacent periosteum may be destructively involved, and tedious exfoliation ensue.

Antiphlogistics are obviously demanded here ; early, active, and tolerably severe ; to avert suppuration if possible. When matter has formed, it must be early evacuated. After evacuation, light water-dressing is applied ; afterwards stimulant medicated, so as to favour cicatrization. We hope that the membrane of the duct will duly recover from the tumid state, that the natural course of the lachrymal fluids will be restored, and that the outward opening in the sac will close.

A chronic affection of the lachrymal sac is not uncommon ; the vascular process reaching no higher than congestion, and limited almost entirely to the lining membrane. An indolent swelling occurs beneath the tendon of the orbicularis, soft, fluctuating, comparatively painless, and capable of being emptied by pressure ; for the puncta remain open, and through them the puriform secretion escapes upwards. The passage downwards is obstructed ; and, indeed, this circumstance seems in most cases to be the origin of the malady.

Sometimes this chronic distension of the sac is the result of an acute or subacute attack. In other cases, it is chronic from the first ; and in these, the state of the general system is usually unsatisfactory. There is a constant liability to acute accession, from but slight causes ; and when such an aggravation does occur, the progress is likely to be rapid and untoward. Suppuration and outward discharge take place ; and fistula lachrymalis is established, perhaps with necrosis of the os unguis.

The treatment consists in prophylactic care, so as to avert such untoward events ; in attention to the general health ; in maintaining a comparatively empty state of the sac, by occasional pressure ; and in the use of stimulant injections or collyria. Sometimes vesication over the sac, by nitrate of silver, is of service.

It is in such cases that Anel's syringe is of most use ; to clear out accumulated discharge, and to convey alterative fluids to the congested membrane. For overcoming structural obstruction in the nasal duct, the use of injection is quite inadequate.

Fistula Lachrymalis.

How this condition is produced, has already been explained. Obstruction takes place in the nasal duct ; the lachrymal sac inflames, suppurates, and ulcerates—the ulcerated aperture discharging externally ; and the wound, only contracting, does not heal. This train of events may originate in the lachrymal passages, and usually does so. But the origin may be in the subcutaneous cellular tissue, as already stated ; or in the bone and periosteum, in those of a mercurio-syphilitic taint of system. The greater number of cases, however, are of a simple nature ; originating in the lachrymal passages ; and involving the deeper parts secondarily, if at all.

The essential parts of the disease are, obstruction in the nasal duct, and an external opening in the lachrymal sac. In treatment it is our object to close the latter ; and that can be done only by removing the former. To this end, an operation is necessary. The patient having been seated on a chair, with the head supported, a sharp-pointed straight bistoury is inserted beneath the orbicularis tendon ; and is not only lodged in the sac, but pushed into the osseous nasal canal as well. To accomplish this dexterously, reference to the anatomy of the parts is necessary, in order that the penetrating instrument may receive the requisite direction ; downwards, a little backwards, and a very little inwards. By the side of the bistoury a stout probe is passed down ; and as the former is slowly withdrawn, the latter is pushed steadily onwards, until it has overcome the obstruction, and emerged with its point in the nasal passage. To effect this perforation, a little force is sometimes necessary. A few drops of blood, escaping by the nostril, proves re-establishment of the duct complete ; also, if the patient be made to expire forcibly, while the nostrils are shut, air and bloody mucus will be ejected upwards, if the probe have been withdrawn.

But it is not enough that the knife and probe procure a temporary re-establishment of the canal. This must be kept permanently open. And to accomplish this, *styles*—or small bougies—are employed ; of various sizes, and made of silver.

One about the thickness of an ordinary probe, and sufficiently long to reach from the upper wound to the nasal aperture of the duct, is lodged in the canal; its flattened head resting on the integument. No fixed size can be defined as generally suitable for commencement of the treatment. It is enough if the style pass easily, after withdrawal of the ordinary probe. Having been lodged, it is allowed to remain. After some hours, the usual resenting of the presence of a foreign body is evinced. The part becomes hot, painful, and swollen; an inflammation is kindled. Still, the exciting cause is not to be removed; the style is left untouched. Fomentation and the minor general antiphlogistics are employed; and usually, after a day or two, the inflammatory signs subside, the style feels loose again in its site, a purulent discharge escapes freely by it; in fact, a compromise seems to be arranged between the part and the intruding substance. After a few days of quietude, the original style is withdrawn, and one a size larger gently substituted. This, in its turn, gives place to a third; and so on; until one is passed, of sufficient bulk completely to occupy the canal. This last is worn for some considerable time, until there is good reason to suppose that the normal calibre of the passage is fully restored, and that its lining membrane has returned to a tolerably sound condition. Then the instrument—which had only been taken out from time to time, for the purpose of being cleaned and replaced—is withdrawn, and a smaller substituted. This, after having been worn for some days, is succeeded by a less; and then one of slender dimensions is inserted only occasionally, and retained for a few hours at a time. By this gradual abstraction of the stimulus, relapse is rendered improbable. For some weeks, the occasional introduction is continued. Then, if the tears continue to flow naturally, and all else seem favourable, the use of the instrument may be wholly abandoned; and the external aperture, now much contracted, may be permitted and encouraged to close entirely. Frequently no aid is necessary to secure this latter event. But should a small fistula threaten to prove obstinate, the touch of a heated wire will usually effect its contraction and closure.

At one time, tubes were employed instead of styles. Experience, however, has declared them to be inferior. They

create the same disturbance in the part, are apt to become obstructed, equally require occasional removal, and, in some cases, their attempted removal has been attended with the utmost difficulty.

At one time, also, it was no uncommon practice to seek a more direct road to the nasal outlet, than through the obstructed lachrymal duct; by perforation of the os unguis. This destruction of unimplicated texture, however, is in the present day very properly deemed unwarrantable.

If necrosis accompany the condition of fistula lachrymalis, exfoliation must be patiently awaited; for not until the dead portion of bone has been thrown off, can the soft parts be expected to heal. At the same time, constitutional treatment will certainly be necessary.

It is well to remember that fistula lachrymalis may be simulated, tolerably closely, by malignant disease. A medullary tumour, formed in connexion with the nasal passages, may project towards the surface at the inner angle of the eye; and its first prominence, yet covered by the stretched and attenuated integument, may occupy the exact locality of the lachrymal sac. But a touch of the part will evince elasticity instead of fluctuation; a glance at the nostrils will show the true seat of the disease; and the cachectic face and general appearance will sufficiently testify of the malignant character.

Obstruction of the Nasal Duct.

We can readily understand how this should be the not unfrequent result of an inflammatory process in the lining membrane. The membrane is at first turgid by soft exudation; and this narrows, and may obstruct, the canal. Such obstruction is temporary in its nature, and capable of yielding to the ordinary treatment, whereby cessation of undue vascular action and absorption of extraneous deposit may be obtained. If the process continue, the exudation becomes more and more dense, and more enduring; partly mucous, in its site, but chiefly submucous; and by continuance or aggravation of such structural change, diminution and obstruction of the canal are rendered plainly inevitable.

For the minor form of obstruction, rectification of the general health, counter-irritation applied over the part, and the use of sorbefacient collyria or injections, will ordinarily suffice. In the more advanced form, the stimulus of the lodgement of a foreign substance in the part is essential to efficient restoration by absorption. In some instances, this indication may be fulfilled without incision ; by passing a probe upwards, from the nasal orifice of the duct. The probe, bent nearly to a right angle, at about three-fourths of an inch from its point, is passed carefully along the floor of the nostril, until it arrives below the anterior extremity of the inferior turbinated bone ; then its point is directed upwards, into the canal. This manipulation is always doubtful, in the first instance, on account of the valvular protection by which the nasal orifice of the duct is guarded, and which must be forcibly broken up ; often it is found to be most difficult to the surgeon, and both teasing and painful to the patient ; not unfrequently it proves altogether abortive. It should never be attempted, unless after repeated practice on the dead body. And, even when the introduction can be effected with tolerable facility, it is not unlikely that such means will in the end be found quite inadequate to remove the disease. In all serious cases, therefore, of obstruction in the nasal duct, it is better at once to have recourse to the same treatment as for fistula lachrymalis ; to puncture the sac, and proceed with gradual dilatation by styles.

Obliteration and Absence of the Nasal Duct.

1. The nasal duct may be obliterated by change of structure in the membrane. Restoration by perforation may be attempted. 2. It may be shut up entirely by change of structure in the bone. Then restoration in the original site is hopeless ; and if anything remedial is to be attempted, it can only be by perforation of the os unguis, and rendering the unnatural aperture permanent. But, generally, such cases require no such treatment. For a time, watery eye exists ; the redundant secretion escaping over the cheek. But, afterwards, the lachrymal gland gradually abates in the exercise of its function, the waste of the secretion grows less and less, and at

length the conjunctival and lachrymal fluids prove little if at all in excess.

A case is related by M. Berard, of congenital absence of the nasal duct ; from which there had resulted a congenital fistula, which continued open and discharging at the age of twenty-one. An artificial outlet was formed for the secretion, by perforation of the os unguis.*

Dacryolithes.

Concretions are sometimes found in the lachrymal passages ; mainly lodged in the sac ; and consisting chiefly of carbonate of lime, cemented by concrete mucous and albuminous matter. The foreign substance produces swelling and lachrymation, and may ultimately cause fistula. Its presence is easily detected by manipulation, and by the introduction of a probe through one of the puncta. The remedy is simple ; incision and removal. The wound may be expected to heal kindly, and without any fistulous tendency.

Affections of the Lachrymal Gland.

Dacryadenitis.—The lachrymal gland is liable to be the seat of the inflammatory process, chronic or acute ; but either form of attack is rare. The secretion is first increased, afterwards arrested, and then restored in a perverted form. A painful swelling forms in the region of the organ ; and the eyeball may be displaced somewhat, and inconvenienced in function. The eyelids are œdematous ; and the conjunctiva is apt to sympathize, and take part in the action. In the acute form, the system suffers severely ; the pain grows intense, and shoots through the head ; and suppuration may take place. If the matter be discharged spontaneously, a fistulous aperture may remain.

The treatment is according to general antiphlogistic principles ; and when matter forms, an early and free opening is of course not neglected.

Atrophy of the Lachrymal Gland may take place ; the or-

* *British and Foreign Review*, No. 24, p. 541.

gan ultimately becoming almost effaced. Then either xeroma results ; or the conjunctival secretion is augmented, to atone for the glandular deficiency.

Tumours of various kinds may form in the substance of the gland. It is liable to simple hypertrophy ; amenable to discussives. Some times it is the seat of a cystic formation ; remediable by simple puncture—or, if that fails, by excision. Carcinoma may attack the gland. Then there is obviously no hope but from early removal. And, in extirpation of the eyeball on account of malignant disease, it is well always at the same time to remove the lachrymal gland—its occupation now gone—whether involved or not ; lest, by its continued presence, return and reproduction of the tumour should be favoured.

Encanthis.

By this term is meant an enlargement of the caruncula lachrymalis. The enlargement may be a simple and somewhat acute engorgement of the part, the result of an inflammatory process resident therein. This will readily give way to the ordinary treatment—scarification, or leeching, fomentation, and sorbefacients.

A chronic swelling, of the nature of hypertrophy or simple tumour, may occur ; less amenable to discussion, and often resistful of it. It slowly increases ; producing deformity by its prominence and bulk ; displacing and obstructing the puncta and lachrymal canals, whence troublesome lachrymation results ; preventing due closure of the eyelids ; and favouring the occurrence of ophthalmia. If discussives fail, under such circumstances, excision is to be practised ; care being taken to leave the puncta, canaliculi, and lachrymal sac uninjured.

Sometimes the caruncle is the seat of tumour of a malignant, or at least suspicious character. In such a case, discussion is hopeless ; and palliatives of any kind are not employed, if excision be practicable. By early as well as free removal only, can immunity from return be hoped for. It is very rarely, however, that excision of this texture, on any account, is required.

IV. AFFECTIONS OF THE EYEBALL.

Ophthalmia.

In such a work as this, it is not to be expected that so wide a subject as the affections of the eyeball—so important, varied, and numerous—should be fully discussed, in all its details. The leading points only can be overtaken ; the student being referred for further information to the many excellent monographs in this department of Surgery.

Ophthalmia is the general term, in which all affections of the eyeball of an inflammatory nature are comprehended ; and, according as the superficial or more deeply seated textures are involved, the ophthalmia is said to be External or Internal.

Affections of the Conjunctiva.

The inflammatory process, in all its grades, is very frequently found established in the conjunctiva ; and the affection varies materially, not only according to the intensity of the vascular action itself, but also according to the cause which induced it, and the state of the system in which it has occurred. Different varieties of the disease may in consequence be enumerated. The most prominent of these are the Simple, Purulent, and Strumous.

Simple Conjunctivitis.

The eye becomes the seat of pain, heat, and lachrymation ; there is an intolerance of light, and consequent shutting of the eyelids—more or less spasmodic ; and frequently there is a sensation as if sand or other foreign matter lodged in the part. On separating the eyelids, the membrane is seen to present an appearance of unusual vascularity ; not from formation of new vessels, but from enlargement of those already there. And it is important to remember that these vessels have a peculiar character, whereby affection of this membrane may be distinguished from the affections of the more deeply seated parts. The vessels are of considerable size, seem to advance from the periphery of the globe, where the membrane

is reflected from off the palpebræ, are tortuous in their course, freely inosculate with each other, and terminate taperingly and gradually on the margin of the cornea ; they are also observed to follow the movements of the membrane, alternately corrugated and stretched ; sometimes they are distinct and separate, because not very numerous ; sometimes they are numberless, constituting one mass of angry red ; and the redness is usually of a bright scarlet hue. Whereas, in sclerotitis, the vessels are small, straight, not affected by the movements of the eyeball, appear first near the margin of the cornea, do not inosculate, plainly occupy a deeper plane, and cause a redness of a pink or purplish hue.

In what is strictly termed Simple Conjunctivitis, the range of the inflammatory process does not reach higher than active congestion. Effusion takes place copiously ; partly into the substance of the membrane, partly beneath it, but chiefly externally. If the crisis of true inflammation be approached, a drying up of the discharge, with aggravation of all the symptoms, marks the untoward advance.

The system is sympathetically involved ; but, in general, its disorder is neither prominent nor grave.

The disease may occur *per se* ; or be but a part of a more general inflammatory attack. Not unfrequently, it is merely a symptom of eruptive fever ; as in measles and small-pox.

The predisposing causes are numerous ; over-exertion of the organ in many ways ; derangement of the general health ; a glaring, sunny, or dusty season. The exciting causes are equally plentiful ; exposure to cold, or heat, or wind, or light ; the application of all chemical and mechanical irritants, directly ; and the indirect influence of irritant causes, more remotely, as of diseased teeth in the front of the upper jaw. The most obstinate forms of the disease are to be expected, when the exciting cause is by a direct irritant which remains in constant operation ; as when a particle of sand, dust, or glass, lodges in the membrane, or when it is constantly rubbed or fretted by a few stray eyelashes.

In the treatment, our first care is to remove the cause. Then antiphlogistics are pursued ; and these, though active, need not be of the highest class. If the cause—as a foreign substance lodged in the membrane—have been removed at

once, nothing may be required, in addition to rest of both body and part, low diet, abstraction of light, and continuous application of cold over the shut eyelids by means of wetted lint. The inflammatory process may be entirely averted ; or, just begun, it may very speedily resolve. If not, then blood is to be abstracted locally, and transition made gradually from cold cloths to warm fomentations. The blood may be drawn from the temple, or by cupping at the nape of the neck ; or by the application of leeches, either at the roots of the hair on the temple, or in the neighbourhood of the eye itself. The last locality is often preferred ; and then care should be taken that all the animals fasten at the inner angle only, immediately beneath the tendon of the orbicularis ; for there, less pain will be occasioned, more blood will be drawn, and less risk both of ecchymosis and of erysipelas will be incurred, than when the application is carelessly and diffusely made along the eyelids. The amount of local depletion will of course vary according to the intensity and duration of the disease, and the age and constitution of the patient.

The action may simply and steadily resolve ; or may pass from the acute to the chronic condition, and there offer to remain. And it is to be borne in mind, that in all cases of this affection, not of a traumatic origin, and not occurring in a robust and vigorous frame, the chronic condition—a state differing little from that of mere passive congestion—is very apt to be assumed at an early period—after the lapse of but a few days. Then, continuance of decided antiphlogistics would but aggravate the morbid state. A change has to be made. It may be advisable to unburthen the distended vessels ; and this will be best done, by scarification of the conjunctiva on the lower lid. By fomentation, the flow of blood is encouraged ; and after this has ceased, gently stimulating collyria are employed ; to restore tone to the vessels, and to favour absorption of the deposit already made :—solutions of zinc, or of nitrate of silver ; or vinum opii begun very weak, and gradually increased in stringency. And the ordinary stimulus of light is again gradually admitted. In those cases in which amendment is tardy or fluctuating, it is well to adopt the aid of counter-irritation ; which is best applied by blistering, either on the temple, or behind the ear. Constitutional treat-

ment is not neglected during any period of the case ; first moderately antiphlogistic, then alterative, and ultimately tonic. If the occurrence of the attack have been connected with the drying up of any habitual or normal discharge, return of this should be sought for and secured.

When one eye only is affected, it is well to remember the close sympathy which exists between the two organs. The unaffected eye, therefore, should, during the acute stage, be kept equally quiet and secluded from the light, and otherwise treated with prophylactic care.

In the obstinately chronic cases, a beneficial change of action may often be obtained by the application of nitrate silver in strong solution, or very lightly in substance, to the inner surface of the lower lid immediately after scarification.—(*Principles*, p. 160.)

A common variety of simple conjunctivitis is termed the *Catarrhal* ; whose prominent characteristics are—in addition to those of the simple form—a profuse secretion of a vitiated mucous fluid from the membrane, œdema of the eyelids, irritation of the tarsal margins, less intolerance of light, more marked remissions, and the presence of the usual indications of catarrh.

Purulent Conjunctivitis.

In this affection true inflammation is established : the peculiar product of inflammation appears, giving the most prominent characteristic to the affection ; and hazard of function by the usual change of structure ensues. The disease may supervene on the simple form ; an aggravation of the inflammatory process having been somehow induced. But such a circumstance is to be regarded as an accidental intensity in acute simple conjunctivitis, rather than as an example of true purulent ophthalmia. Usually, the action is from the first intense, and suppuration is very speedily attained. The first symptoms are pain and itching in the palpebral conjunctiva ; and often there is a sensation as if foreign matter lodged there. Then the ordinary characters of conjunctivitis appear, in an intense form. The pain is not confined to the eye, but shoots through the head, and not unfrequently extends

to the face also. The eyeball becomes quickly covered by meshes of enlarged conjunctival vessels ; the membrane itself is infiltrated and tumid ; a profuse purulent secretion is poured out ; the eyelids are swollen, and œdematous, often to a great extent ; ordinarily, the eyeball is concealed by the tumid lids ; on opening them forcibly, purulent matter escapes in increased quantity, and eversion is apt to ensue—the engorged and red conjunctiva becoming exposed.

As the disease advances—abating from the true inflammatory acmé—the conjunctival lining of the eyelids, more especially of the upper, changes from the uniform, vascular, and villous appearance, to one of more irregularity, as if granulating. The conjunctiva is then said to be *granular*. This term, however, does not imply that the membrane becomes actually studded with true granulations ; the fleshy elevations being mere enlargements of the natural papillæ. These continue to furnish a profuse discharge ; and the friction of them over the ocular conjunctiva doubtless maintains the general morbid action.

The ocular conjunctiva, it has been already said, undergoes change of structure. Exudation and extravasation take place both interstitially and beneath it. In consequence, the part becomes the seat of a red, angry-looking swelling ; sometimes so great as to bulge considerably over the margins of the cornea, leaving that texture in the relative position of a depression or dimple. This state is termed *Chemosis* ; the result of true inflammation in the conjunctiva ; very different from *Ecchymosis*, which is also of frequent occurrence here, and which consists merely in the escape of blood in the fine subconjunctival cellular tissue—usually the result of external injury, and in itself important only by discolouration. (P. 80.) When the action is acute and crescent, and the chemosis great, the cornea is in danger of sloughing ; partly from over-action, partly by the strangulating effect of the surrounding swelling.

The system sympathizes prominently. At first inflammatory fever is developed. Afterwards, the form of Constitutional Irritation is likely to be assumed. Vision is in much danger ; by change of structure in the cornea, and also by

disorganization of the entire globe ; for to the latter result this affection may advance, under circumstances of either neglect or severity.

In Egypt the disease prevails as an epidemic ; and has done so for ages ; of the most virulent and intractable form ; very fatal to sight ; originally induced by sun and sand ; propagated, also, by direct contagion ; and in effecting reproduction by the latter mode, the flies are said to be active agents—passing from one eye to another, tainted with the contagious matter. In this country, it is happily both less frequent and less severe. It may follow injury ; and then the purulent discharge is to be looked on as the mere consequence of a high amount of vascular action induced by a powerful exciting cause. Want of cleanliness, and of ventilation, and the over-crowding of inmates—as in schools and barracks, and on board of ship—predispose to the production of this form of disease—of a more genuine character—under the influence of a comparatively slight exciting cause. Thus occasioned, it is undoubtedly contagious ; the matter of one patient applied to the sound conjunctiva of another being capable of inducing a similar disease. And when many patients happen to be crowded together, without due cleanliness and ventilation, there is good reason to believe, that the infectious character is also acquired.

The treatment, in energy and promptitude, requires to be proportioned to the rapidity and intensity of the disease. It is only by active and early, as well as suitable measures, that we can hope to avert change of structure and impairment of function. Blood is drawn not only from the part, but from the system ; with a full antiphlogistic effect in view. The bowels are well acted on. Regimen is most sparing ; quiet, and seclusion from all stimuli—light more especially—are complete. If not strongly contra-indicated, by constitutional or other causes, calomel and opium may be freely administered, to gentle ptyalism ; for action is intense, texture delicate, and function important. The eye is diligently fomented ; and it is well to medicate the fœtus, anodynely. If the case be not seen till the disease has made progress, and lost much of its sthenic type, both locally and

constitutionally, such severe and spoliative measures are of course unwarrantable. Also, a like reservation will be required in the case of the puny adolescent, perhaps scrofulous as well as sickly, who may happen unfortunately to become a victim.

When the second or chronic stage has set in, we cease from constitutional antiphlogistics—though still maintaining the most guarded regimen; and the local, too, are proceeded with differently. The swollen conjunctiva is freely scarified, in order to empty it of its sanguineous contents, and at the same time to afford ample space and opportunity for the interstitial and subconjunctival exudation to escape. The palpebral conjunctiva is divided, with a lancet or fine knife, in a horizontal direction; the eyelids being freely everted for this purpose. And the separation of the lids is maintained for some time, so as to favour the escape of blood. The chemosed ocular conjunctiva is incised, also in a horizontal direction; lest, otherwise, the cornea, already in a critical condition, might have its sloughing accelerated and made certain by interruption of the vascular supply. Or, rather, the incisions are begun at the corneal margin, and made to radiate outwards to the circumference. And this incision of the chemosis is not always to be reserved for the chronic stage; but is often highly expedient, at an early period, when the action is yet acute; in order to save, if possible, the threatened cornea, as well as to obtain a general resolute effect upon the inflammation. Fomentation is continued for some hours after the scarification, so as to favour flow of blood; and then the use of nitrate of silver is advisable. Probably the best way of employing this remedy is to apply it, either in substance, or in strong solution, to the eyelids; on these it exerts a direct and powerful remedial effect, opposing the congested and granular state; and from these it is gradually diffused over the globe, exerting an effect thereon more gentle but equally beneficial. The application is made daily, or every second day, according to circumstances. Throughout the whole treatment, it is essential that the matter be not allowed to accumulate beneath the swollen and shut lids; these are to be gently opened from time to time,

and the pus washed away by the injection of some simple fluid—mere warm water, or this slightly medicated—anodyne or stimulant, according to the stage of the disease. For general use, there is nothing better than a weak solution of the nitrate of silver. Also let it be borne in mind, throughout the whole period of treatment, that the discharge is of a contagious nature; and let patient, practitioner, and attendants guard accordingly against direct propagation of the disease.

If the morbid state still persist, and become more and more chronic in character, the nitrate of silver may be well superseded by some more purely stimulating remedy; as the sulphates of zinc and copper. Or some of the preparations of mercury may be employed, perhaps with an alterative virtue in addition to that of stimulus; in form either of ointment or of solution. At this period, too, counter-irritation, by blistering behind the ears, or on the nape of the neck, will not be without its use. And the state of the system must be well considered; a combination of tonics with alteratives will probably be required.

When a swollen and altered state of the palpebral conjunctiva obstinately remains, after comparative disappearance of the other symptoms, this lingering one must be attacked with more energy. The sulphate of copper or nitrate of silver is applied firmly, with a truly destructive object in view. Or a sufficiency of the redundant part may be at once removed, either by knife or by scissors. Then the granulating surface which remains is made the subject of ordinary treatment. Of course, care is taken that the removal of texture is not excessive; otherwise entropion is likely to ensue.

Such is the nature of the ordinary Purulent Ophthalmia. Two varieties of the disease require a separate though brief notice.

Ophthalmia Neonatorum.—By this term is understood Purulent Conjunctivitis occurring in the recently born child. It may be induced by mere want of cleanliness, by imprudent exposure of the delicate organs of sight to intense light, or by the direct application of other stimuli. But most fre-

quently it owes its origin to direct contamination of the conjunctiva by vaginal secretion—of a purulent nature—during parturition. The disease presents its ordinary characters ; and there is much risk of permanent loss of sight by pearly opacity of the cornea.

Children have been born with opaque corneae, apparently the result of purulent conjunctivitis. There is reason to suppose, therefore, that this disease may occur in utero.

Treatment is founded on antiphlogistic principles ; proportioned to the age and condition of the sufferer. But much depends on an early commencement being made. Then mild measures suffice ; bleeding will seldom be required, either by leeches or by scarifications ; and counter-irritation, also, will rarely be necessary. It is enough to employ simple ablution, frequently repeated—perhaps every second hour ; soon gently medicating the collyrium by means of alum, or nitrate of silver—the proportion of which is gradually increased. And attention is at the same time paid to the primæ viæ, and general system.

Gonorrhœal Ophthalmia.—The application of recent gonorrhœal matter from the urethra of one person to the conjunctiva of another, produces the most intense form of purulent conjunctivitis. In the same patient, it would seem that the contact may be made with comparative impunity. One eye ordinarily is affected ; for it is seldom that both are at once inoculated ; and in this respect there is a difference from the ordinary purulent conjunctivitis. In the latter also, the morbid action usually commences in the palpebral conjunctiva, resides there chiefly, and extends only secondarily to the ocular portion of the membrane. But in the gonorrhœal form, the reverse is the case ; the action would seem, in most cases, to commence in the ocular conjunctiva, and to extend thence to the palpebral. The action is unusually intense ; and the hazard to vision is great ; for the cornea, surrounded by an aggravated chemosis, is in a most perilous state, and not unfrequently perishes by sloughing. Or the action may pass deeply ; causing important change of structure in the iris, or even terminating in general disorganization of the globe. The treatment is in no way peculiar ; only propor-

tioned in activity to that of the disorder. General bleeding ought seldom if ever to be omitted at the outset ; and this may be regarded as imparting a proper tone or key to the rest of the treatment. Strong solutions of the nitrate of silver are found to be of much service, so soon as the first brunt of the inflammation has been subdued ; and, by some, the blackening effect of nitrate of silver applied to the exterior of the eyelids is supposed also to prove beneficial. Solutions of the chlorides are useful ; not only for the purpose of cleanliness ; but also with an expectation that they may prove of some virtue as disinfectants.

Strumous Conjunctivitis.

This affection of the membrane—in addition to the ordinary traits of the strumous cachexy—is characterized chiefly by remarkable photophobia, or intolerance of light ; by comparatively little pain, and vascularity ; by tendency of the enlarged vessels to collect into bundles ; by tendency of these fasciculi to stretch towards the corneal margin, terminating there in pustules ; by exacerbations occurring in the morning, while remissions are vesperal—the opposite of what obtains in other ophthalmiæ. Corneal change of structure, hazardous to vision, is extremely apt to ensue. The affection seldom occurs after puberty ; and prevails chiefly during childhood. At that age, the intolerance of light, with spasmodic closure of the eyelids and copious lachrymation, is certainly the most prominent symptom. The child “ keeps its hands pressed on the shut eyelids, and turns its face on the nurse’s shoulder, or, if in bed, on the pillow, even in comparative darkness. In chronic cases, the edges of the lids are kept in this manner in an almost inverted condition, and the eyelashes get under and are there retained, augmenting the distress.” The cheeks are scalded by the discharge which almost constantly wets them, and become covered with an angry eruption. The features are contorted ; and a confirmed expression of pain and discontent is assumed. On attempting to open the lids, much suffering is occasioned ; the lachrymation increases, the lids become more inverted, and the eyeball is rotated up-

wards and outwards so as to conceal the cornea. When forcible separation is deemed essential, small, blunt, ivory hooks will be found very useful.

The treatment consists in constitutional management, suited to the particular cachexy conjoined with a chronic inflammatory process in an important part; in slight local depletion—at first, by scarification, or leeches; in applying the nitrate of silver to the integument of the lids, lightly, so as to blacken merely; in the use of a weak solution of this substance as a collyrium; and in counter-irritation by blistering behind the ear. The last remedial means, however, is to be used with much caution; otherwise it is apt to excite troublesome scrofulous enlargement of the cervical glands. Sometimes benefit is obtained by the local use of belladonna, dropped into the eye, in solution; or applied to the orbital margins in the semi-solid form. It probably affords relief by temporarily paralyzing the iris, and so placing that contractile texture in a condition of repose.

Granular Conjunctiva.

The granular condition, dependent on a hypertrophied state of the mucous papillæ, of the palpebral conjunctiva, has been already noticed—as constituting an important integral part of the purulent conjunctivitis. But a similar change of structure may occur, quite independently of this latter disease. It may be the result of any chronic inflammatory process resident in the palpebral membrane. At first, doubtless, there is mere enlargement of the normal structure; but, after a time, this is more or less altered by continuance of plastic deposit; the surface coming to be dense as well as prominent, rough, irregular, and sometimes fissured; and the alteration usually is most conspicuous over the tarsal cartilage. The upper eyelid is more prone to suffer than the lower.

It can be readily understood how such a structure, at each movement of the lid, must greatly fret the ocular conjunctiva; causing an irritation there sufficient to light up an inflammatory action, and more than sufficient to maintain an action which has been already established. To remove the altera-

tion of structure, therefore, becomes a most important therapeutic indication. In the first instance, scarification is made trial of; followed by the application of nitrate of silver, used either lightly in substance on the part, or in strong solution. If the nitrate prove unsatisfactory, other astringents and alteratives may be employed instead. Failing these, the altered part is to be removed; by knife or caustic. The nitrate of silver, or sulphate of copper, may be applied firmly to the surface, so as to have a destructive effect. But, in general, it is better to take away at once, by knife or scissors, a sufficiency of the altered structure; great care, as usual, being observed, lest, by excessive ablation, entropion be established on cicatrization. By some, a temporary suspension of the affected eyelid is made; and the cure is said to be hastened materially, in consequence of the cornea and ocular conjunctiva being thus freed from the irritant friction. "A transverse fold is made in the upper lid; and the base of this fold is pierced, by means of a curved needle, with two threads of cotton. The extremities of this kind of seton are then fixed on the forehead by means of a piece of diachylon, the eyelid being sufficiently raised, not to touch the globe of the eye." Not only is the organ thus usefully suspended; but some benefit may also be expected from the counter-irritation produced by the thread in the integument. Erysipelas, however, may occur; and precautions against this casualty, must accordingly be adopted.

Pterygium and Pannus.

According to some, *Pterygium* denotes a vascular and fleshy thickening of the ocular conjunctiva; according to others, a vascular and fleshy expansion formed in the subconjunctival cellular tissue. The latter are probably correct. The formation is of a triangular form; the base resting on the internal canthus, and the apex stretching towards the cornea. When of moderate size, and not advanced further than the corneal margin, vision is not interfered with; but when the cornea is begun to be invested, the affection then ceases to be a mere deformity or inconvenience; sight is in danger; and remedial measures are required. Sometimes the web is thin

and membranous ; consisting chiefly of varicose vessels held together by fine cellular tissue. Sometimes the structure is dense, firm, and fleshy ; sometimes containing a large proportion of adipose substance.

The term *Pannus* is usually applied to the denser form of web ; not of the triangular form ; but as a broader sheet, covering a large portion of the globe, and generally interfering very materially with the cornea. By some, the term is applied only to those cases in which the cornea is completely invested.

In the milder cases of Pterygium, cure is attempted by scarification and astringents ; the scarifications being made across the dilated vessels, in the sclerotic conjunctiva. In those cases in which the cornea is encroached upon, excision of the sclerotic portion is to be had recourse to, if the milder measures fail—as they are likely to do. The membrane is elevated by a fine hook, and carefully removed by knife or scissors. The corneal covering is then usually found to disappear. When, in Pannus, the whole cornea is invested, a cure has been effected by inoculation of the morbid tissue with blenorrhœal matter—the discharge of purulent conjunctivitis ; the inflammatory action which thence results having the effect of breaking up the morbid tissue, and rendering it amenable to removal by the absorbents—a result very different from what would not fail to supervene, on a similar inoculation of the healthy organ. Such treatment, therefore, is plainly inapplicable, except to those extreme cases in which the cornea presents no sound part, but is completely covered ; and in which the web is thick and fleshy.

Irritable Conjunctiva.

The conjunctiva may be the seat of irritation ; a state altogether independent of the inflammatory process—at least in the first instance.—(*Principles*, p. 161.) No increased vascularity, or other morbid appearance, is to be found in the eye. Yet there are lachrymation, photophobia, spasmodic closure of the lids, and a painful sensation as if foreign matter irritated the globe. This state may continue ; a perverted

condition of the nerves only. Or it may be merged in an inflammatory process, which becomes developed secondarily, and is shown by redness of the conjunctiva and other usual signs.

In the treatment, antiphlogistics fail. While belladonna, used both to the part and internally, affords marked and speedy relief; the state of the general system being of course not neglected.

Affections of the Cornea.

Corneitis.

The inflammatory process, resident in the cornea, may be either an original affection, or merely an extension from a previously existing conjunctivitis. And it may originate either from injury done directly to the part itself, or from an exciting cause applied to some other part of the surface of the eye. The conjunctival investment only may be affected—and this is most likely to occur when the affection is a mere extension from conjunctivitis; or the action may be mainly and originally resident in the proper substance of the cornea. All forms of conjunctivitis, when of any duration, are apt to implicate the cornea; but the strumous form most especially.

A red zone of dilated vessels encircles the corneal margin; and between the two there is no intervening clear space, of white sclerotic, as in affections of the deeper parts of the eye. When the conjunctival covering is involved, vessels are seen traversing it, in greater or less number, continuous with those constituting the outer zone. When the proper substance alone is involved, such vascularity is, in the first instance, not discernible. There is pain in the part, and in the orbit generally; lachrymation; and intolerance of light. By and by, change of structure is evidently in progress. The cornea loses its transparency, becoming turbid, and of a bluish white appearance. And then the various results of the inflammatory process may ensue—varying according to the intensity and advance of the action; deposit of plastic lymph, producing thickening and opacity; formation of pus between the corneal layers, afterwards absorbed, or making its way

either externally or into the anterior chamber; ulceration, commencing superficially with mere abrasion, or originating in the giving way of a pustular formation; lastly, gangrene, either of the whole or of a part—the former event seldom occurring in the case of simple corneitis alone, but only when this is part of an extensive and severe ophthalmia, with much chemosis. If a foreign body be left imbedded in the cornea, it is very evident that inflammation, suppuration, and ulceration must ensue; in obedience to the general law, whereby natural extrusion of foreign matter is effected in all living textures.

In the outset of the case, antiphlogistics are employed, with activity; afterwards, astringents. Sometimes, in consequence of frequent reaccessions of acute action, the former kind of treatment requires to be almost uninterruptedly sustained for a considerable number of days. In the obstinately chronic stage, material benefit is sometimes derived from division of the enlarged vessels—over the sclerotic, and near the corneal margin.

Strumous Corneitis is of very frequent occurrence in the young; more decidedly chronic than the simple form; and usually mainly resident in the conjunctival covering. Vascularity is less, and more diffuse; and the zonular arrangement at the corneal margin is less distinctly marked. Opacity is the ordinary result; and pustules, ending in troublesome ulcers, are not uncommon. The treatment is such as is calculated to subdue chronic conjunctivitis; with an especial reference to the depraved state of the system. In general, the affection proves of rather an intractable nature.

Aquo-Capsulitis.—This term denotes the inflammatory process resident in the serous membrane of the aqueous humour, including the internal layer of the cornea. It may occur *per se*; or it may form an integral part of the preceding affection. It is characterized by “a pale, deeply-seated opacity, which is unequally distributed, imparting to the cornea a mottled appearance; and by a turbid or cloudy state of the aqueous humour.” Sometimes lymph is exuded; and either coats the membrane, or floats loose in the anterior chamber. The treatment is as for corneitis.

Abscess of the Cornea.

Matter, as we have seen, may form between the layers of the cornea ; a result of corneitis. If it collect at the lower part, the accumulation usually assumes a crescentic form ; resembling the white semilunar mark at the root of the nail ; and hence such an appearance is termed *Onyx*. But it may be deposited elsewhere ; in the form of dots or points, which may either remain separate, or may unite with each other by increase and extension. The fluid seems to be purulent. It may, however, be a less advanced inflammatory exudation.

Antiphlogistics will plainly be the most likely means whereby the secretion may be arrested, and its disappearance by absorption favoured. And in order to effect these two indications rapidly, in time to save structure and function, the systemic influence of mercury is highly available—obtained as soon after blood-letting as possible. Failing absorption, one of three events may occur. The small collection may spontaneously discharge itself internally, into the aqueous humour ; or it may assume the pustular form, and escape externally ; or an artificial opening may be made for its external evacuation. In the greater number of cases, the artificial opening is withheld, in the hope that disappearance by absorption may take place ; and the frequency, with which this result does occur, would lead to a strong suspicion that the fluid is not truly purulent. In the chronic stage, absorption may be expedited by the use of gentle stimuli—more especially a weak solution of the nitrate of silver. If, however, the fluid be of considerable quantity, causing tension in the part, and painful symptoms of an aggravated character, we do not hesitate to put in force the general principles of surgery ; we evacuate externally, by an opening carefully made, penetrating only the anterior parietes of the abscess. The chasm contracts and heals ; leaving a cicatrix more or less opaque.

Ulcer of the Cornea.

Ulcers, as we have seen, are the result of corneitis. Their

origin may be from without—when the conjunctival covering is chiefly affected ; and then the commencement is with superficial abrasion, sometimes extensive ; or a pustule forms, elevating the conjunctival layer—and on the giving way of this, ulceration follows, still superficial. Or the origin may be from within ; abscess collects between the true corneal layers, and is discharged externally, leaving an ulcerated aperture ; or foreign matter has lodged, and is extruded by suppuration and ulceration. In either of these cases, the ulcer is deeply seated, and serious.

The ulcer here, as elsewhere, presents different characters, under different circumstances. At first it is acute ; the inflammatory action is still in progress, loss of substance is advancing, and there is no attempt at repair. In this state, the ulcer looks as if a portion of the corneal substance had been dug out mechanically ; the edges are abrupt, and in and around them are the usual signs of inordinate vascular action. Very frequently, a distinct plexus of vessels is found leading to the ulcerated point. The pain, lachrymation, and photophobia are most distressing. Or the ulcer degenerates into the irritable form ; the loss of substance growing neither larger nor less ; the margins and surface showing an angry and vascular appearance ; and the symptoms all undergoing intense aggravation. Or the sore may be of a healthy and healing disposition. Then the edges are less abrupt, and as if bevelled off ; the chasm is diminishing ; a white haziness surrounds the margins, and invests the surface, denoting the deposit of plastic exudation ; and the unpleasant symptoms are all very much diminished. Or the ulcer may stop short in the progress towards cicatrization, and assume the indolent character ; becoming stationary, and causing comparatively little inconvenience. This last phase, however, is certainly not the one of most frequent occurrence.

In the case of the acute ulcer, it is obvious that the only suitable treatment is the antiphlogistic ; and this is to be continued, along with an especial regard to the general health, until the over-action is subdued, and symptoms of repair succeed those of destruction of texture. Then, in the healing sore, we will content ourselves with watching the natural progress of cure, and carefully guarding against re-accession of

the inflammatory action ; by exclusion of light and other stimuli, by regulation of diet, and by the use of tepid soothing applications. In the irritable sore, nothing is so useful as the nitrate of silver ; applied either lightly in substance to the ulcer, or in strong solution by means of a hair pencil. It acts probably in two ways ; by its escharotic power destroying the sentient extremities of the nervous tissue ; by its coagulating power forming a protecting film for the raw surface. The application is repeated every second day, until the irritability cease ; or the interval is shortened or increased as circumstances may seem to require. When either the irritable or inflamed condition threatens to prove obstinate, great benefit often is derived from smart counter-irritation by blistering behind the ears. For the indolent sore, the various stimulant collyria are suitable. When the strumous habit is strongly declared—as it too often is, in ulcerated cornea—little permanent good will be done by any local management, unless constitutional treatment be at the same time duly conducted.

As a general rule, the preparations of lead should never be employed as collyria, in the case of ulcer of the cornea. An insoluble chloride of lead will be formed ; and this, becoming entangled in the cicatrix, will render it more irremediably opaque than it otherwise would have been. The sustained use of the nitrate of silver, also, should be conducted with caution ; lest an olive-coloured stain ensue.

When the ulcer is deep, acute, and situate near the centre of the cornea, there is great risk of perforation of the inner layer, escape of the aqueous humour, and protrusion of the free margin of the iris, to a greater or less extent. To obviate this last accident, as much as possible, belladonna is employed to maintain a dilated state of the pupil ; so that the margin of the iris may be retracted, out of harm's way. If, however, the site of ulcer be towards the circumference, the use of belladonna would be plainly prejudicial.

Previously to completion of the perforated aperture, the membrane of the aqueous humour sometimes protrudes, in the form of a small transparent vesicle ; and this condition is termed *Hernia of the Cornea*. Then our efforts to arrest ulceration must be redoubled, ere perforation is complete ; also

keeping the iris fully dilated, in case of hazard thereto should perforation take place.

Sometimes the perforating ulcer heals only in part ; contracts, but does not close ; becoming a fistulous aperture, through which the aqueous humour continues to escape. This is remedied by the occasional application of nitrate of silver, finely pointed, to the part ; and by a tonic system of treatment constitutionally.

The iris, protruding through the perforated cornea, forms a black tumour, usually of no great size ; bearing no slight resemblance to the head of a fly ; and therefore termed *Myocephalon*. Sometimes the iris does not protrude, but simply rests upon the aperture, and closes it up ; and in this anormal position it may become adherent. In either case, the pupil will be deformed ; and vision may be seriously impaired. The indications of cure are, to restore the iris to its normal position, and to hasten cicatrization of the aperture. In recent cases, the protrusion, when slight, may be carefully replaced with a curette ; the patient is laid on his back, the room is darkened, and belladonna is applied ; and antiphlogistics are not withheld, to avert or moderate the inflammatory action which is to be expected to ensue. When, however, protrusion is considerable, the aperture being capacious, immediate replacement is not desirable ; temporary and partial protrusion being the salutary means whereby Nature prevents complete escape of the aqueous humour, and consequent collapse of the eye. Under such circumstances, we content ourselves with rest, exclusion of light, supine posture, use of belladonna, and occasional application of the nitrate of silver ; thus promoting healing of the sore, removing irritability of the texture involved, and favouring the gradual replacement of the iris. In chronic cases, in which the displaced portion of the iris has contracted permanent adhesions with the cornea, replacement cannot be effected ; ablation of the protruded part is had recourse to, either by cutting instruments, or by caustic ; and then cicatrization of the remaining sore is attended to.

Opacities of the Cornea.

Nebula is the thin cloudy opacity which follows inflammatory affection of the conjunctival covering of the cornea. It arises from slight structural change remaining in that tissue; and is the form of opacity most likely to be removed, so as to leave the part altogether of its pristine character. The indications of treatment are—to obtain final extinction of any vascular excitement which may remain; and, afterwards, to favour disappearance of the structural change, by absorption. The former indication is fulfilled by the usual means; the latter, by the guarded use of various stimulant applications. The nitrate of silver, sulphate of zinc, or other substances, may be applied in solution; or fine powders—as calomel, oxide of zinc, alum, &c.—may be blown on the part through a quill; great care being always taken, that this part of the treatment is not overdone, and inflammatory reaccession, with probable extension of the opacity, consequently re-established. In the more obstinate cases, the use of iodine is highly advisable, both externally and internally; the local application being made in the form of either ointment or solution. Of late, the local use of the hydrocyanic acid has been found of considerable avail. Galvanism, too, has been applied to the opaque part, apparently with some success.* The state of the eyelids should, in all cases, be carefully attended to; for, not unfrequently, a granular condition of the palpebral conjunctiva is the cause of the opacity's continuance, if not of its first formation. The curative process is necessarily gradual; and patient perseverance in the use of the remedial means is consequently required.

Albugo denotes the more deeply seated opacity, which results from plastic exudation between the layers of the cornea. It, too, is amenable to absorption; but not so favourably as the conjunctival deposit. The treatment is conducted on the same principles; but with a certainty of longer perseverance being required, and with a less sanguine expectation of an altogether successful issue. If the changed part be seen traversed

* *Brit. and For. Rev.* No. 24, p. 542.

by blood-vessels, the prospect of complete cure may be regarded as especially unpromising.

Leucoma is the dense, pearly opacity, which results from cicatrization of a granulating wound or ulcer of the cornea ; it is, in short, a corneal cicatrix—dense, opaque, and little amenable to change. Sometimes there is a black point in the otherwise white opacity ; denoting entanglement, at that part, of a portion of the iris. Treatment, with the hope of discussion, is of little or no avail. Remaining over-action is subdued, and stimulants employed. But the latter are not used with the hope of altering the cicatrix itself ; but only in order to dissipate the nebulous or the albuginous halo, with which the leucoma is usually surrounded. If the opacity be central and small, vision will be greatly improved by habitual dilatation of the pupil by means of belladonna ; if it be both central and large, the only hope of amendment is by the formation of an artificial pupil.

It has been proposed to dissect off opacities of the cornea ; but obviously success can never follow any such procedure ; inasmuch as the loss of substance, caused by the dissection, must heal in the ordinary way, and, so healing, must produce at least an equally opaque and extensive cicatrix. It has been proposed, however, to operate in one class of cases ; with a rational and fair prospect of ultimate benefit. The opacity which follows injury of the cornea by sulphuric acid, would seem, occasionally at least, to be a chemical incrustation on the cornea, rather than a vital change of and in its structure ; sulpho-proteic acid is produced, and adheres to the external layer of the cornea ; and this may be scraped away, immediately after receipt of the injury, by the edge of a fine knife, leaving the rest of the part clear and free.*

In advanced years, and sometimes even in the comparatively young adult, the corneal periphery gradually becomes opaque, and of a gray colour. The affection is termed *Arcus senilis* ; a mere deformity ; and not amenable to remedial treatment. Sometimes, in the very old, the corneal texture becomes of an osseous density.

* *Lancet*, No. 1010, p. 537.

Staphyloma of the Cornea.

By the general term Staphyloma, is understood a protrusion of the coats of the eyeball. Staphyloma of the cornea is of two kinds ; the Conoidal and the Spherical. Both are the result of inordinate vascular action. The former is the more common ; and may be either partial or complete—impairing vision, or utterly destroying it. The projection is of a conical form ; the corneal structure is opaque and thoroughly changed ; there is thickening, or hypertrophy, as well as loss of transparency ; and, in the complete variety, the anterior chamber is usually obliterated by adhesion of the iris.

In Spherical Staphyloma, the cornea yields at every point, its lamellar arrangement is wholly destroyed, it is unequally thickened, and the protrusion tends to be great ; the iris is at first uniformly adherent, but, not yielding as the cornea protrudes, it is torn into radiated fragments, giving a stellated appearance to the part.

In either form, the prominence may steadily advance ; or it may remain stationary ; or it may give way at its apex, discharging the aqueous humour, and then diminish—at least for a time. When the projection is beyond the eyelids, much irritation necessarily ensues.

In the partial staphyloma, it has been proposed to arrest the further progress of the part outwards ; by causing an inflammatory action in the substance of the cornea, whereby exudation and consequent thickening may take place, imparting solidity sufficient to resist further displacement ; and for this purpose, escharotics have been employed—hitherto, however, with but indifferent success. By occasional puncture of the cornea, and consequent discharge of the aqueous humour, temporary relief may be obtained ; and even permanent arrest of growth may follow on perseverance. But when the staphyloma is complete, and of such a size as to prove a serious annoyance, it is better at once to have recourse to the final cure—ablation of the protruding part. And this is done by either knife or scissors ; the apex of the cornea having been first secured and steadied by a hook. The aqueous humour escapes ; the eyelids are replaced ; antiphlogistics are

put in force ; and the wound is expected to heal by granulation—affording a firm and depressed cicatrix.

Conical Cornea.

Sometimes the cornea, “ retaining its transparency, gradually assumes a conical or pyramidal form ; and when viewed from certain positions, reflects the light so strongly as to exhibit a peculiarly brilliant and sparkling appearance, characteristic of the disease. It generally affects both eyes, though not in an equal degree ; has been observed at all periods of life, but more commonly about the age of puberty ; and is said to be most prevalent among females.”* On the whole, it is a rare affection ; and fortunately it is so, being but little capable of amendment. If the apex protrude from between the lids, it is liable to become opaque. Or ulceration may take place ; and then staphyloma is not unlikely to supervene.

In the clear conical cornea, palliation may be obtained by adapting spectacles provided with a small central transparency. Lately, it has been said, that amendment, if not cure, has followed perseverance in the use of purgatives and emetics ;† but how the beneficial result is so obtained, it is not easy to understand or say. When the apex is opaque, temporary amelioration of sight may be secured, by transferring the pupil to a point of the circumference which is as yet clear.

Over-distention of the Cornea.

Simple over-distention of the cornea, by an unwonted accumulation of the aqueous humour, produces both dimness and prominence. If this state be the concomitant of an existing inflammatory process pervading the eye, by subjugation of this the cornea will be restored. If, on the other hand, the morbid state is not so connected, but of a passive and indolent nature, antiphlogistics will do no good, and are likely to do harm. From an internal use of the iodide of potassium,

* LITTELL.

† *Dublin Journal of Medical Science*, January 1844, p. 357.

or—failing this—from a cautiously given alterative course of mercury, more benefit is to be expected ; a diminution being thus made in the aqueous humour, on whose plethora the over-distention depends.

Affections of the Sclerotic Coat.

Sclerotitis.

This may occur as part of a general inflammatory process, however excited. Not unfrequently, it exists *per se*, and then almost uniformly is of a rheumatic origin ; exposure to cold, probably, having proved the exciting cause. It is most frequent in the adult, and about the middle period of life. Pain is complained of, of a dull, aching kind ; increased by pressure, and by movement of the globe ; partly resident in the eye, but mainly in the forehead and temple ; and marked exacerbation occurs at night. Often there are other pains in other parts of the body. There is but little lachrymation or intolerance of light. The minute sclerotic vessels are seen, enlarged, radiating in straight lines, to form a vascular plexus, of a pink hue, around the circumference of the cornea. Not unfrequently, the pupil is contracted, and incapable of its wonted activity of motion ; and this denotes that the iris has participated in the morbid action. The conjunctiva, too, in general, sympathizes more or less ; and by its large, florid, tortuous vessels, the sclerotic characters may be in part obscured.

Antiphlogistic treatment is had recourse to ; with an activity and continuance proportioned to the intensity of the symptoms. The iris is placed and kept under the influence of belladonna. Mercurial and anodyne friction is made on the temple and brow. And the system is put under the influence of colchicum, of the iodide of potassium, or of other remedies supposed to be of anti-rheumatic virtue. Occasionally, the affection is found associated with ague ; and then a combination of quinine with colchicum is found of much service. Should the iris become involved, antiphlogistics are plied with redoubled energy, and the systemic influence of mercury is unhesitatingly employed.

Staphyloma of the Sclerotic.

This is much less frequent than staphyloma of the cornea. Like it, it is the result of morbid vascular action, and change of structure so induced. The tunic becomes attenuated, and yielding; the choroid coat, engorged, shines through it; and irregular bulging forwards takes place, constituting several swellings, of a bluish or leaden hue. The external vessels are usually enlarged and tortuous. The bulging is seldom to a large extent; and consequently does not demand surgical interference. Sometimes, however, protrusion takes place from between the lids, and then diminution by either puncture or incision is expedient, as in the analogous affection of the cornea.

*Affections of the Choroid Coat.**Choroiditis.*

Choroiditis, though a frequent associate of iritis, rarely evinces an independent existence. When occurring singly, it is usually confined to one eye; and is most common in females of a strumous tendency. The sclerotic vascular characters are exhibited, in a faint and imperfect degree; pain is deep-seated, and accompanied with a feeling of tension; the eyeball is tense and hard to the touch, and by pressure the pain is aggravated; the sclerotic is attenuated, is of a blue or leaden hue, and tends to become irregularly prominent at certain points; the pupil is dilated, irregular, and of impaired mobility; intolerance of light and lachrymation are not great; vision is more or less impaired. Ultimately, the whole globe is plainly enlarged, and staphyloma of the sclerotic is in progress—the thinned coat having been pushed forwards, either by the swelling caused by the enlarged and tortuous vessels, or by the exudation which has taken place from them. By the inward pressure, too, the retina has become more and more affected, and loss of vision is at length complete. General internal ophthalmia is not unlikely to supervene.

The treatment consists of smart antiphlogistics at the outset ; and, in general, more faith is to be reposed in abstraction of blood than in the systemic influence of mercury—a result probably dependent on the peculiar vascularity of the texture affected. In the subacute stage, counter-irritation and alteratives are of service. In the chronic, tonics are plainly indicated. And when it is remembered that the patients are usually of a strumous habit, we will not only wish to be both early and free in the tonic part of the treatment ; but also as sparing of the spoliative remedies, at first, as due regard to structure and function will permit, and especially grudging in the use of mercury. If staphyloma of the sclerotic have occurred, puncture or incision may become necessary, as already explained.

Muscæ Volitantes.

Weak vision, rendered imperfect and interrupted by opaque bodies seeming to float before the eye, is generally understood to depend on congestion of the choroid coat. The ordinary cause is over-exertion of the organ, combined with sedentary habits. The remedial treatment consists of moderate depletion from the neighbourhood of the part, moderate purging, alteratives, careful diet, repose of the organ, bodily exercise, and ultimately tonics.

A more ordinary kind of interruption to vision, somewhat of this nature, is ever liable to occur, from mucus passing slowly over the cornea. If this prove troublesome by continuance, or frequency of repetition, a purge, attention to diet, and a short abstinence from strained use of the eye, will suffice for removal.

Affections of the Iris.

Iritis.

Inflammatory affection of the iris may be the result of injury, or of idiopathic origin ; it may occur primarily, itself constituting a disease, or it may be but a part of a general deep ophthalmia ; often it is connected with the syphilitic, and

mercurio-syphilitic taints of system ; and not unfrequently it is of a rheumatic character.

The pink vascular zone is seen on the sclerotic ; and there is at first a distinct interspace of white, between the vascular zone and the corneal margin ; ultimately this is obscured by involvement of the conjunctival vessels in sympathetic disorder. The pupil is contracted, and much less movable than in health, under both ordinary and extraordinary stimuli. Indeed, returning mobility of this part is one of the first and surest signs of resolution of the attack having fairly begun.* The iris changes its hue ; if of a light colour naturally, it becomes greenish ; if dark, it assumes a reddish appearance. It is also perceptibly swollen ; sometimes it can be seen of increased vascularity, and bulges forwards in the anterior chamber. The eye is painful, intolerant of light, and furnishes an increased lachrymation ; pain is also felt in the brow, temple, and head, and undergoes marked nocturnal exacerbation. Sight is greatly impaired.

As the disease advances, these symptoms increase. The aqueous humour becomes turbid and excessive ; the cornea consequently loses somewhat of its transparency. Fibrinous exudation takes place in and from the iris ; sometimes coating it with a thin layer, sometimes studding it with nodulated points ; sometimes diffused in the anterior chamber ; often mainly situated at the free margin of the iris, hanging pendulous in fringes from the circumference, forming a delicate network stretched across, or perhaps completely occluding the already contracted pupil. And at this stage, if not before, the contracted pupil is found to be irregular in form, in consequence of fibrinous adhesions having been formed with the capsule of the lens ; an irregularity which becomes especially distinct, when partial dilatation has been effected by belladonna. Extravasation of blood may take place ; small clots are sometimes to be seen resting on the iris ; or the blood may gravitate to the bottom of the anterior chamber, and accu-

* Gromelli, from the observation of successful injection, concludes the iris to be an erectile tissue. He supposes that contraction of the pupil during the inflammatory process depends simply on engorgement of the radiating vessels, which are fixed at the circumference, and free at the pupillary margin ; and that return of the blood, in resolution, allows the iris to shrink, and the pupil consequently to expand.—*Brit. and For. Rev.*, No. 29, p. 233.

multate there, constituting the state termed *Hypocæma*. Or, the true inflammatory crisis may be attained, and suppuration occur; the pus may form small abscesses in the iris, which soon give way and discharge their contents; or it may be at once effused into the anterior chamber, and collect there, constituting *Hypopion*. Such events indicate an intense action; not only likely to prove most prejudicial to the delicate texture involved, but also certain to extend to those adjoining, causing the most grave and general disaster.

The result of fibrinous exudation is denoted by various terms, according to its extent and site. When the fibrin occludes the pupil permanently, the case is termed one of *False Cataract*. When adhesion has formed between the posterior surface of the iris and the capsule of the lens, the condition *Synechia posterior* is said to be established. When the iris, bulging forwards, has reached the posterior layer of the cornea, and become adherent thereto, the term *Synechia anterior* is applied. After a time, the vascularity of the organized fibrin can often be distinctly seen, when a strong light is thrown upon the part.

During the active progress of the disease the system sympathizes prominently; labouring under a marked form of inflammatory fever.

Treatment.—Our principal object is to arrest the progress at an early period; ere exudation or structural change has taken place; averting all hazard from the important part, if possible. If foiled in this, we still press towards a speedy antiphlogistic result, knowing that nothing else will permit an early and favourable absorption of the exudation which has occurred. Our remedies are early, active, and powerful. Blood is taken from both part and system; and the part is kept dark, and diligently fomented. The bowels are freely moved; and then, as rapidly as possible, the system is brought under the full influence of mercury—unless there be some pre-existing and undeniable contra-indication. If the system be plainly and acutely strumous, and consequently intolerant of mercury; if the attack be connected with the phagedænic form of the venereal disease—when we know by experience that mercury generally proves hurtful; when there is a known idiosyncrasy rendering all exhibition of the mine-

ral dangerous by the induction of Erethismus :—then a substitute must be sought, likely to aid the general antiphlogistics in preventing exudation, and expediting its appearance by absorption. Turpentine is available for this end ; given in full and sustained doses.* From the first belladonna is applied, so as to oppose the tendency to contraction in the pupil, and effect dilatation if possible. The semifluid extract is smeared on the eyebrow and temple ; or an aqueous solution may be dropped between the eyelids ; but the former method of application is usually preferred, at least in the first instance. In those cases in which mercury is not contra-indicated, mercurial friction on the temple and forehead is advisable, to maintain the constitutional effect which the internal exhibition of the mineral has produced. In the chronic stage, counter-irritation takes the place of the more direct antiphlogistics. And, ultimately—traces of disease still lingering—the internal administration of tonics, especially of quinine, proves beneficial ; dissipating the state of passive congestion which had threatened to remain.

When Hypopion has formed rapidly, when the purulent accumulation is considerable, and when pressure on the parietes of the anterior chamber is consequently hazardous, an opening is to be made at the lower part of the cornea, by means of a cataract knife, so as to effect evacuation. If the accumulation, on the contrary, be gradual, and the amount of pus not great, the opening is withheld, and absorption hoped for.

The extravasated blood of Hypoæma receives the same treatment as extravasations elsewhere. Active antiphlogistics are plied vigorously ; and, these having told favourably on the action, the extravasated blood may be expected to disappear gradually by absorption. The occurrence of Hypoæma, however, as indicating a high degree of inflammatory action, is always of evil omen.

The adhesions, or *Synechiae*, are superable in the recent state. By perseverance in the local use of belladonna, the

* Mr. Carmichael's Formula is as follows :—Recipe—Ol. Terebinth. rect. unc. unam—Vitel. unius ovi—Tere simul, et adde gradatim, Emuls. Amygd. unc. quatuor—Syrup. cort. aurantii unc. duas—Spir. Lavend. comp. drachm. un. & semisse—Olei Cinnamomi, guttas quatuor. M. Dosis—unc. un. ter in die.

imperfectly organized fibrin is extended or torn, and the iris recovers its normal play. At the same time, absorption of the deposit is to be favoured, by moderate continuance of the mercurial friction.

Syphilitic Iritis is a frequent variety of the affection, occurring as part of the secondary train of symptoms. Its characteristics are :—the accession along with the other venereal symptoms ; marked nocturnal exacerbations ; a dark hue of the vascular zone ; fibrinous deposit occurring in nodules, of a brownish hue, studded on the margin of the pupil as well as on the surface of the iris. In the chronic stage, such nodules become very distinct ; and the margin of the pupil is observed to be thickened, corrugated, and inverted. The treatment is as for the ordinary examples of the disease.

The *Rheumatic and Arthritic Iritis* is not of frequent occurrence. It is characterized by :—accession taking place along with other symptoms of a rheumatic or gouty character ; the vascular zone is of a purplish hue, and is not a little obscured by early involvement of the conjunctival vessels ; the pupil, contracting, inclines to assume an oval form ; there is peculiar proneness to relapse. The treatment consists of the ordinary antiphlogistic remedies directed against acute and inflammatory rheumatism ; colchicum, guaiac, and iodide of potassium—one or other—taking the place of the internal administration of mercury.

Strumous Iritis is far from uncommon ; the result of extension of the inflammatory process inwards, in cases of strumous corneitis. The previously existing opacity of the cornea is very liable to mask the internal and more important action ; deceiving the practitioner as to its existence, until the opportunity for successful treatment has passed, unoccupied. Mercury must be used very sparingly, if at all ; and, at a comparatively early period, the administration of quinine, with tonic regimen, is required.

Changes in the Pupil and Iris.

Unusual dilatation of the pupil is termed *Mydriasis*. It may be congenital ; it may follow on inflammatory affections

implicating the deep textures of the eye ; it may be of idiopathic origin ; or, as we have formerly seen, it may be connected with grave disorder in the cerebral functions. The admission of an excess of light to the retina is found to be a serious inconvenience ; and vision is confused and impaired accordingly. The remedial treatment consists in detection of the cause ; removal of this, if possible ; and subsequent stimulation of the part, by frictions on the temple and brow, and exposure of the eye itself to ammoniacal vapour. In the idiopathic forms of paralysis of the iris, benefit is likely to follow an active mode of treatment recommended by M. Serres ; cauterization of the corneal margin by nitrate of silver. Such direct stimulus seems to be capable of wonderfully arousing the nervous power of the part. In other cases, palliation results from contracting the space for admission of light, by spectacles ; as in the case of conical cornea.

Permanent dilatation of the pupil invariably accompanies amaurosis ; and of course will not be expected to disappear, unless the amaurotic condition have been previously removed.

Myosis denotes unusual contraction of the pupil. This is the immediate result of Iritis, as we have already seen ; it may also attend on disorder of cerebral function ; sometimes it is induced by habitual straining of the eye on small objects—as in microscopists, engravers, watchmakers, &c. Ordinary and useful vision is necessarily impaired. The means of cure consist in removal of the cause, and patient use of the belladonna. In the artificers, just enumerated, temporary abstinence from the usual avocations will often suffice to restore the normal state.

Tremulous Iris.—A trembling, or oscillatory movement, of the iris, not unfrequently accompanies amaurotic affections ; and seems also, in most cases, to be connected with a change in the vitreous humour. It is but little amenable to treatment. And is chiefly notable as a sufficient contra-indication of operative interference, as regards cataract and artificial pupil.

Adhesions of the Iris—*Synechiæ*—have been already considered. They may be the result of wound, of corneitis, or

of iritis. In synechia anterior, complete, and accompanied with opaque cornea, cure is manifestly hopeless. When incomplete, and the cornea clear, amendment by the formation of an artificial pupil is within our power. When the adhesion is partial and recent, it may be remedied by mercurial inunction and patient use of the belladonna. Similar treatment will avail in synechia posterior, when recent and partial. But, when complete, it is usually accompanied with opacity of the crystalline capsule, and it may be of the lens itself; and, under such circumstances, amendment of vision can be effected only by an operation directed against the cataract.

Occlusion of the Pupil.

The pupil may be shut in various ways. Itself, remaining in a normal state, may be obscured by the cornea, which has become simply opaque, or opaque and conical. Or, the cornea remaining clear, the iris may contract during inflammatory action, and the pupil may become occupied by organized fibrinous deposit. Or both iris and cornea may undergo serious structural change; as when the complete synechia anterior takes place in staphyloma. In the last mentioned case, restoration of sight is manifestly impossible. But in the other examples, something may be done by forming an *Artificial Pupil*.

Before proceeding to any such operation, however, certain circumstances are invariably to be taken into consideration. It must be ascertained:—that the adhesions of the iris are irremediable by the influence of mercury and belladonna; that the opacity of the cornea is fixed, and proof against the ordinary discussives; that the other parts of the visual apparatus—especially the retina and vitreous humour—are in a sound and healthy condition; that the eye has not only ceased to be the seat of all inordinate vascular action, but, also, that it is not prone to resume such action on the application of a fresh exciting cause. Operation is also very properly held to be inexpedient, so long as the patient enjoys a tolerable degree of vision with either eye; and it is plainly contra-indicated, when one eye only is affected.

Three distinct modes of operation are practised ; all implying puncture of the cornea, and division of the iris—so as to make a sufficient gap in the latter texture, opposite a clear portion of the former. The desired space in the iris may be obtained by incision, excision, or laceration. Accordingly the operation is said to be by *Corotomia*, *Corectomia*, or *Corodialysis*.

Corotomia.—An aperture having been made in the cornea, a knife is introduced, and division of the iris is effected to the required extent ; or the section may be made by means of scissors. The objection to this mode is, that the gap, though wide enough and efficient at the time of operation, tends speedily to contract, and becomes inadequate.

Corectomia.—The cornea is punctured as before. If the original pupil exist, behind a corneal opacity, Mr. Tyrell's blunt hook is carefully introduced ; the pupillary margin is entangled by it ; and on withdrawing the instrument the iris comes with it. The protruding portion of the iris is then removed by scissors ; enough having been taken away to secure the permanent establishment of an efficient fenestral aperture. When the original pupil is quite shut, an aperture must first be made by the needle which punctured the cornea ; and into this opening the blunt hook is then inserted. Or, the cornea having been punctured, protrusion may be caused, during escape of the aqueous humour, by pressure on the globe ; and then the protruding part may be cut away. Sometimes, it may be necessary to introduce scissors through the corneal wound, and so to effect the requisite excision.

Corodialysis.—This is a tearing away of the iris from its ciliary attachments. A curved needle, or hook, is introduced through the cornea ; and, having been fixed in the circumference of the iris, a sufficiency is displaced in the proper direction.

Whichever method be followed—and the practitioner must be guided by the circumstances of each case in making his selection—it is obvious that great care must follow, so as to avoid the accession of an untoward amount of vascular action. The eye is kept shut, and removed from all stimulus. Blood is taken, and that freely, on the occurrence of the first suspicious symptom ; and the antiphlogistic regimen is rigidly enforced.

Also, let it be remembered, that the new pupil, on its first formation, should seem rather too large than otherwise ; there being always a decided tendency to subsequent contraction.

Affections of the Retina.

Retinitis.

The acute form of this affection may follow direct injury by wound, or exposure to intense light or heat, or undue and sustained exertion of the eye ; or it may be of idiopathic origin. It is accompanied with agonizing pain, deep seated, shooting through the head, aggravated by the slightest motion of the eye, attended with giddiness, and often with delirium. There is very great intolerance of light, with lachrymation ; an appearance of luminous bodies often passes before the eyes ; vision is greatly impaired, from the first ; the pupil may be at first contracted, but soon becomes dilated, and remains motionless. Then the intolerance of light greatly abates, and blindness becomes complete—the retina being no longer capable of obeying the accustomed stimulus. The system is involved in marked inflammatory fever. At first, the outward indications of increased vascularity are not very apparent ; but, ultimately, the action extends to the other deep textures of the eye, and the usual signs of internal ophthalmia become developed.

The treatment is most rigidly and actively antiphlogistic ; texture is delicate, function is important, and the implicated tissue is both adjoining to and continuous with the cerebral substance. The treatment consists in seclusion from all stimulus, of both part and system ; bleeding, both local and general, repeated again and again if need be ; purgatives ; and the free exhibition of mercury so as to exert its full influence on the system. And we are not satisfied with mere abatement of the acute symptoms. We insist upon full resolution ; knowing how dangerous persistence of the disease, in a chronic form, must ever prove to the function of sight.

Amaurosis.

By this term is understood impairment of vision, more or less complete, dependent on change in the retina, optic nerve, or brain. And that change may be either structural or functional. In the latter case, there is good hope of cure by suitable treatment; in the former, even palliation is hardly within our power.

The causes are:—structural change in the retina, optic nerve, or brain, by the inflammatory process, chronic or acute; compression of these parts in any way—as by extravasated blood, inflammatory effusion, or formation of tumour; a congested state of these parts, induced by over exertion of the eye or brain, by irregularity of bowels, by habitual exposure to much light and heat, by intemperance—by, in short, whatever tends to cause determination of blood to the head. Wounds of the supraorbital branches of the fifth nerve, and the influence of atmospheric exposure on the same parts, have often been followed by amaurosis; an example of sympathetic nervous influence, not easily explained in its details.

The symptoms are:—impairment of vision, gradual and crescent; at first there is perhaps mere obscuration of sight, but this soon gives place to thorough perversion of that function; objects being seen of erroneous proportion, and colour. In the congestive and inflammatory forms, more or less pain is complained of. At first, there may be intolerance of light; but ultimately a glare is borne with impunity, or is rather desired than otherwise. Ocular spectra are seen; either constantly, or from time to time; especially after exertion of the eye; and they may be dark or luminous, massy or scintillated, steady or flickering. The pupil is dilated; the iris is changed in hue, sluggish, and ultimately motionless; the eyelids move seldom; the eye has a vacant, staring expression; and the patient acquires a peculiar, uncertain gait. Often there is no fixed or decided pain in the part; but rather a sensation of tension and uneasiness. Sometimes the eyeball has a tremulous or oscillatory motion. On the whole, the ordinary and characteristic symptoms are, the painful sensations, the impairment and perversion of vision,

the ocular spectra, and the state of the pupil. In applying the catoptrical test, the three images of the candle are seen as in the healthy eye—a sufficient distinction from both glaucoma and cataract. From the latter it is further distinguished by vision being improved by strong light, and impaired by belladonna ; by the state of the pupil ; by the absence of crystalline opacity ; by perversion of sight existing—not mere impairment ; and by the characteristic stare and gait of the patient.

But there is no uniformity as to symptoms. In most examples, the pain ceases on full establishment of the disease ; in others it continues unabated. In most, the symptoms gradually advance to complete loss of sight ; in others, independently of treatment, the symptoms reach a certain point and then remain stationary. One patient may continue to have the intolerance of light throughout, which is so common in all at the beginning ; he courts a dull light, in consequence, and is said to labour under *Hemeralopia*, or night blindness. The majority of advanced Amaurotics, on the contrary, seek a strong light, finding their vision improved thereby ; and are said to be affected with *Nyctalopia*, or day blindness. Some see objects double ; and this variety is called *Diplopia*. Others see but the half of an object ; and this is termed *Hemiopia*. In many, the pupil is at first contracted, there being an originating inflammatory process present ; in most, ultimate and permanent dilatation exists ; but, in a few cases, the iris seems natural in both form and hue, and is perfectly obedient to the stimulus of light.

The untoward progress is very various. Sometimes vision is lost at once, as when extravasation takes place by sudden congestion. Sometimes months elapse ; or even years may be occupied in the gradual decay. The affection is most common in the middle period of life ; and while it seldom attacks both eyes at once, both are ultimately involved in the great majority of cases.

In the inflammatory form, the mode of treatment is plain ; the ordinary antiphlogistics are demanded, in the cases at all acute. In the chronic examples, moderate depletion, followed by an alterative course of mercury, is most likely to prove useful ; and counter-irritation is at the same time ad-

visible. When congestion is suspected, moderate depletion is practised, with purgation; and then the ordinary means are taken for preventing local determination of blood; in most of such cases, an early use of tonics is expedient. If the affection have followed the disappearance of an accustomed discharge, normal or not, return of that discharge is to be sought. If an atonic system plainly exist, a roborant plan of constitutional treatment is as plainly indicated. If the disease be apparently but a secondary symptom, as it were, of some constitutional malady—as jaundice or hysteria—that malady is to be thoroughly eradicated from the system, if possible. If intestinal irritation plainly exist, or be suspected, it is to be attacked by the ordinary means. In short, the predisposing and exciting causes should, if possible, be ascertained and removed. And then, this paramount indication having been more or less perfectly fulfilled, certain means are in our power whereby to rouse the retina to a resumption of its function. Foremost, in this class of remedies, is strychnia. It may be given internally, in cautious and small doses; a few drops of an alcoholic solution—three grains to the ounce—may be dropped into the eye; or the endermoid application may be made on the temple or forehead. A blister having been applied, a quarter of a grain of the powder is sprinkled on the part, once or twice a-day. The dose is gradually increased, until a bitter taste is felt in the mouth, and uneasy shrugging of the shoulders begins to be complained of; then a temporary discontinuance of the remedy is expedient. Failing strychnia, electricity may be employed.

Affections of the Crystalline Lens and Capsule.

Cataract.

Cataract denotes opacity of the crystalline lens—*lenticular*; of the capsule, *capsular*; of both lens and capsule, *capsulo-lenticular*. The affection may occur at any age, in consequence of an inflammatory process having been induced in the part, by external injury or otherwise. Sometimes it is a congenital defect. Most frequently it occurs in advanced

years ; one sign, among many, of the frame's gradual decay.

The prominent symptom is impairment of vision. At first, objects are seen as if obscured by gauze or mist ; this obscuration gradually increases ; and ultimately vision is almost, but not entirely, lost. Sometimes dull pain is complained of in the eye and forehead ; very frequently the part is the seat of no abnormal sensation. Sight is improved by a diminution of light ; it is better at twilight than at noon, and also better when the patient is seated with his back to the light, than when facing the window ; for, the pupil, then dilating, permits the rays of light to pass to the retina through the margin of the lens—yet unobscured. For a like reason, the local use of belladonna materially improves the sight. On looking into the eye, an opacity is plainly discernible, occupying the pupil, and situate immediately behind it. And whenever a deliberate examination is contemplated, belladonna should be previously applied, to dilate the pupil, and so to afford every facility for ascertaining the extent and character of the opacity. In proportion as sight is impaired, the opacity is found to have increased. It is greatest at the centre ; when completed it is of a gray, white, bluish, or amber hue ; and this is not unfrequently relieved by a dark annulus on its exterior—the shadow of the iris falling on the less opaque periphery of the cataract. In the most advanced cases, the patient is still able to distinguish light from darkness. The iris is not necessarily impaired in its functions. Both eyes are seldom attacked at once ; but usually both are ultimately involved.

What is termed the *catoptrical test* of cataract is conducted thus. The pupil having been dilated by belladonna, the patient is seated with his back to the light, in a darkened room ; and the surgeon holds a lighted taper in front of the eye. In a sound organ, the depth of the clear pupil exhibits three reflections, or images, of the light ; one superficial, bright, and distinct, caused by reflection from the cornea ; one deep seated, pale, and indistinct, caused by reflection from the anterior portion of the lens ; one, in a mesial plane, small and obscure, caused by reflection from the posterior portion of the lens ; the two first, erect, move consentaneously with the

lighted taper ; the last mentioned, inverted, moves slowly, and in an opposite direction. In the case of cataract, the middle inverted image is first extinguished ; and afterwards the deep erect one also becomes invisible. Or, to speak more accurately, " opacity of the posterior capsule prevents the production of the middle inverted image ; and opacity of the anterior capsule destroys the two posterior ones. In other words, in posterior capsular cataract, the middle or inverted image is not seen ; in cataract of the anterior capsule, and in capsulo-lenticular cataract, the anterior straight one only is visible." In amaurosis, the three images are always distinct, as in the sound eye. " Glaucoma, only when much advanced, obliterates the inverted image ; while, in all its stages, it renders the deep erect one more evident than it is in the healthy eye."

From glaucoma and amaurosis cataract is further distinguished, by the state of the pupil, the site and character of the opacity, the character of vision, the expression and gait of the patient.

The condition of *Spurious Cataract* is said to exist, when organized fibrin occupies the pupil. This is distinguished from true cataract by being of a yellow colour ; by being adherent to the iris, which is puckered, altered in hue, and irregular in its pupil ; and by being plainly traversed by red blood-vessels.

Cataracts vary as to density. The hard cataract is most frequent in the old ; and is characterized by its brownish or amber tint. The lens is shrunk in its dimensions, and the greatest amount of opacity is central. The iris is left free and immovable ; the dark annulus surrounding the cataract is remarkably distinct ; and in the twilight, as also after the use of belladonna, objects may be discerned with tolerable accuracy. *Soft* cataract is of fluid or semifluid consistency, large and bulging, and completely occupies the pupil. It is most common in the young, and is characterized by its bluish-white or milky colour. The iris is clogged in its movements, and the impairment of vision is great. The opacity is not always homogeneous ; dots or streaks are occasionally observed ; and these may change their form and site from time to time. In what is termed the *Radiated Cataract*, the opacity

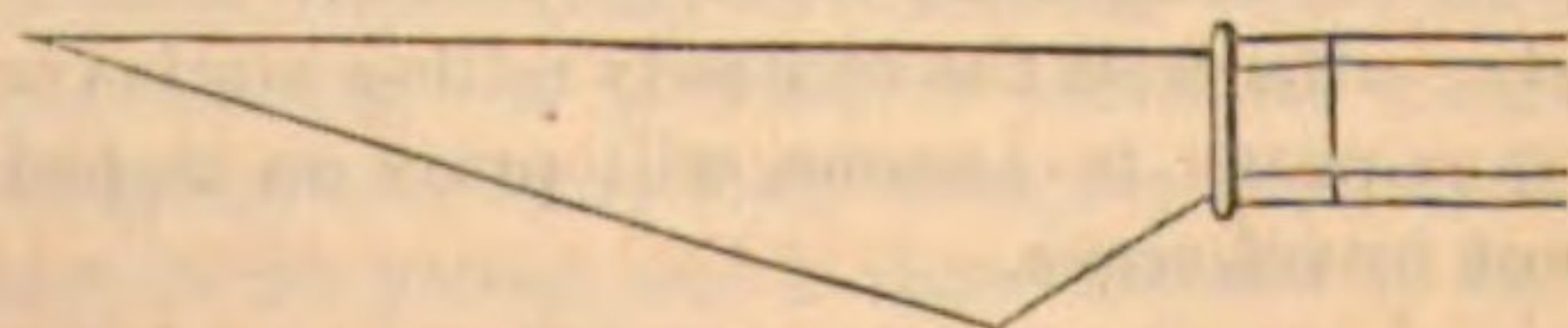
is formed in streaks ; and not unfrequently commences at the circumference, thence extending towards the centre. This peculiarity is readily observed on inspection ; and, as can be easily understood, vision will for sometime be found to be better with a contracted than with a dilated pupil.

Treatment.—Unfortunately our art has as yet proved impotent, in attempting to stay the progress of advancing cataract ; and, when it has fairly formed, no faith need be reposed in any attempts at simple discussion of the opaque structure. By operation only can amendment be obtained. The obstructing body may be wholly extracted ; or it may be pushed out of the axis of vision ; or it may be broken up into fragments, which are expected to be afterwards absorbed ; or it may be simply drilled, so as to admit the aqueous humour, and so favour absorption of the crystalline substance. Before any operation, however, is undertaken, certain preliminaries require to be adjusted, as in the case of Artificial Pupil. We must first be satisfied that the eye is in other respects sound ; so that, when the obstruction to light is removed, there may be a fair prospect of vision being restored. There must be no amaurosis, glaucoma, ophthalmia, change in the vitreous humour, or affection of the eyelids. The patient must be free from any marked constitutional ailment. The state of the atmosphere should be mild and favourable.* While there is a tolerably useful amount of vision enjoyed by either eye, it is more prudent to refrain from operation ; the results of operation being found most favourable in cases well matured. And, one eye only should be operated on at a time. Finally, by careful regimen, and medicinal discipline if necessary, the system is brought into a favourable state—is rendered not morbidly susceptible of inflammation. In the congenital variety, operation should be practised early ; otherwise the unsteady rolling motion which the eyeball is so prone to assume, will prove an impediment to subsequent interference.

* “ Couch cataracts upon a day so fair,
That neither winds nor clouds disturb the air ;
When spring with smiles fills the earth's richest lap,
Or autumn makes the tree put off his cap ;
The moon in the full, or in conjunction sly,
Or tracing Aries, or in the Gemini.”

Extraction.—Through an aperture in the cornea, the opaque lens is to be extruded—an operation, necessarily comprehending a considerable amount of wound, and no slight amount of injury done to the parts. If inflammatory action remain in abeyance, the result is most successful. But if inflammation supervene, or accident happen to the vitreous humour during the procedure, sight is lost irretrievably. Many favourable circumstances require to be present to warrant the attempt at extraction. The cornea should be sound, the anterior chamber of normal dimensions, the iris mobile and non-adherent, the globe prominent and steady, the cataract lenticular and dense. The patient should be in sound health; neither plethoric and inflammatory, nor weak and incapable of plastic exudation; capable of self-control, and of maintaining the supine posture; not troubled with cough, sneezing, or asthmatic ailments. And this series of qualifications necessarily limits the operation by extraction to a minority of the cases of cataract.

The pupil having been moderately dilated by belladonna—not immoderately, otherwise escape of the vitreous humour is favoured—the patient is placed before a steady light, either seated, or recumbent; and the sound eye is covered by a bandage. The surgeon, holding the knife in his right hand, is placed either in front or behind, according to the eye which is affected. An assistant opens one lid, with his fore and middle fingers; at the same time steadying the eyeball by gentle pressure; the surgeon opens the other eyelid, and assists in steadying the globe, by the fingers of his left hand. The head is secured by the assistant. The flap may be made superiorly or inferiorly, according to the fancy of the surgeon, or as circumstances may seem to indicate. The knife is Beer's.



Held firmly between the thumb and points of the fore and middle fingers, the flat edge of the point is made to touch the cornea gently once or twice, in order to reassure the patient, and secure steadiness of the organ. The point is then enter-

ed near the corneal margin, in a perpendicular direction, lest separation of the corneal laminae should take place. Penetration having been effected, the direction of the knife is changed, and made parallel to the iris; the knife is then pushed steadily across, the point emerging at a spot directly corresponding to that of entrance; and the steady advance of the instrument is continued, until section of the cornea is complete. Then all pressure is removed from the eyeball. If the aqueous humour escape prematurely, the iris falls forward, and is consequently brought into dangerous contact with the edge of the knife. In this case a halt is made, and gentle pressure applied to the cornea yet uncut. This may succeed in replacing the iris, and then the section is continued. If not, the knife is withdrawn, and probe-pointed scissors are substituted. The corneal section having been completed, the eyelids are permitted to close, the eye to rest, and the pupil to dilate. Then, the lids having been gently re-opened, the sharp end of a curette is gently introduced beneath the flap, and as gently made to divide the capsule, crucially. The slightest possible pressure is then made on the upper eyelid—on the anterior part of the globe, just behind the corneal margin—so as to dislodge the lens—and nothing more. On the escape of the opaque body, the corneal flap is seen to be rightly adjusted, and the eyelids are permitted finally to close. Should the iris have prolapsed, exposure to bright light will probably suffice for its replacement, by causing contraction of the tissue; if not, the protruded portion may be reponed, by a gentle use of the blunt extremity of the curette. The eye is covered with a light dossil of lint, wetted, and kept continuously cool. The patient is laid on his back, with the head elevated; light and every other stimulus are rigidly excluded; the most sparing regimen is enjoined, the act of mastication even being interdicted; precautions are taken against coughing, vomiting, and sneezing; and, if need be, involuntary rubbing of the eye is provided against also. If possible, the eye should not be uncovered, and exposed to the stimulus of light, for at least five or six days. The symptoms of inflammatory action are carefully watched and opposed; by bleeding, purging, abstinence—but obviously not by nau-

seants. The period of inflammatory accession having passed, the organ is gently and gradually accustomed to its wonted stimulus ; but exercise of its full function is to be very tardily resumed.

Depression, or Couching, implies downward displacement of a solid cataract, which it is not found expedient to extract. The pupil having been dilated by belladonna, the position of the patient is arranged as for extraction. The needle, Scarpa's, is pushed perpendicularly through the sclerotic, on the external aspect of the cornea, in the central transverse axis of the eye, at a distance of two-tenths of an inch from the corneal margin : this point being selected in order to avoid the two divisions of the long ciliary artery, which vessel usually bifurcates at a distance of three-tenths of an inch from the corneal margin ; also to avoid wounding the retina and the ciliary body. The needle having entered, the posterior capsule should first be freely divided—laceration of the capsule being necessary to prevent obstruction to sight by present or future central opacity of that membrane. The point is then brought parallel to the iris ; and, having been seen in the pupil, is lodged in the cataract. By elevating the hand, the lens is displaced towards the bottom of the eye, gently and steadily. And the instrument, having been allowed to rest there for a few moments—detaining the displaced body, till the vitreous humour closes over it—is gently extricated and withdrawn. The eye is shut, and antiphlogistic precautions are put in force, as after extraction.

A variety of this operation consists in directing the eye upwards and inwards ; piercing the sclerotic at the lowest part of the eye ; passing the needle upwards, with a semi-rotatory movement, and with its point directed backwards, so as to prepare a way of descent ; continuing this rotatory movement, after the pupil has been reached, so as to lacerate the capsule ; entangling the lens by the point, and then steadily and slowly withdrawing the instrument. The lens is expected to follow the needle, and to remain depressed, in contact with the punctured part of the coats of the eye.

Comparative facility of performance is in favour of depression. But the manifest objections are ; danger of chronic inflammatory action, in consequence of the displaced body compressing or irritating the retina and ciliary processes ; disorganization of the vitreous humour ; and the possibility of future escape of the lens upwards—again to obstruct the transmission of light.

Reclination is a modification of depression. The lens, instead of being completely dislocated and pushed downwards, is simply made to revolve partially ; so as to turn its superior margin backwards into the vitreous humour ; while its anterior surface is directed upwards, and remains on a level with the lower edge of the pupil. Less injury is done to the retina than in depression ; but re-obstruction of the pupil is at least equally probable.

The operation to promote absorption—*Dissolution*—by perforation and disturbance of the opaque body, is practised when the lens is of fluid or semifluid consistence. The procedure is simple, and easily performed, but requires repetition ; and the result is tardy, and may be uncertain. The object is, to admit the aqueous humour to free and general contact with the substance of the lens—a circumstance which experience has shown to be very conducive to absorption or solution of the latter. When a *breaking up* is intended, the needle is introduced as for depression. Its point, having reached the pupil, is made to divide the capsule, and also to break up the lens into fragments. If the lens be fluid, no division of its substance is necessary ; it escapes at once into the aqueous humour, on wound of its capsule. When of soft consistence, a few of the fragments often find their own way into the anterior chamber ; if not, they are gently placed there by the needle ; for in that locality absorption or solution seems to advance more rapidly than behind the iris. Care is taken, however, not to dislodge the lens forwards in mass, or in bulky fragments ; otherwise tension and untoward inflammatory action may be induced, in the iris and other parts implicated. At the first operation, division of the lens is effected but sparingly—if at all. Many deem it sufficient to divide the capsule only ; and certainly it is well not to attempt any displacement ; but at the second and third sittings, fragmen-

tal separation, and displacement, may be attempted more fearlessly. A few weeks are allowed to intervene between the operations ; and after each the ordinary antiphlogistic precautions are put in force.

The operation by *drilling* is effected through the cornea. A straight needle is entered near the corneal margin, and passed through the pupil into the substance of the lens. Having penetrated into this, to the extent of about a sixteenth of an inch, it is rotated freely, and carefully withdrawn. The proceeding is repeated from time to time, as in the breaking up ; on each occasion a fresh part of the lens being chosen as the site of puncture. The object is to admit the aqueous humour ; and, by its agency on the lens, gradual absorption of the opacity is expected to occur.

After removal of the lens, in any way, an atoning convex glass requires to be adjusted to the eye ; in order fully to restore vision. This is the duty of the optician. Only let it be the surgeon's care not to permit any such adjustment, and resumption of the organ's full exercise, until at least two months have elapsed after the operation—and more especially if that operation have been by extraction ; for not until then will the organ be safe from accession of inflammatory action.

If after removal of the lens, either by operation, or by spontaneous solution—as sometimes happens in the congenital form—the capsule become opaque, and, occupying the pupil, obstruct vision, it may be got rid of in one of three ways. It may be extracted, through a minute aperture in the cornea, by a hook, or by small forceps. It may be detached at its ciliary margin, by a needle, and depressed, like a lens. It may be crucially divided by the needle ; and the flaps, shrinking from the centre, may leave the pupil patent and sufficiently free to light.

Affections of the Humours of the Eye.

Hydrophthalmia.

Dropsy of the eye may depend on excess of the aqueous humour, of the vitreous humour, or of both. In the first case,

there are tension, prominence, change of form, and increasing nebulosity of the cornea ; the iris is changed in colour, and impaired in mobility ; the pupil is dilated ; vision is much affected ; there is a sense of fulness in the eye ; and more or less headach is complained of.

When the vitreous humour is redundant, enlargement and tension of the whole eye occur, and the enlargement is greatest in the antero-posterior diameter ; the iris is motionless, and arched forwards ; the sclerotic is attenuated, and has a bluish or brown appearance ; vision is soon wholly lost ; and the pain and tension become great. Ultimately, the eyeball protrudes between the lids, inflames, ulcerates, and becomes collapsed.

Palliation is in our power, by évacuation of the redundant fluid ; by puncture of the cornea or sclerotic, or by incision of the former texture. Sometimes the progress of the disease may be delayed, if not arrested, by counter-irritation and constitutional alteratives.

Synchysis Oculi.

Synchysis denotes an opposite condition of the vitreous humour ; a deficiency, and unnatural fluidity. The eye is shrunk and flaccid, and the iris is in constant tremulous motion ; the pupil is motionless, and vision is either impaired or lost. Not unfrequently the lens becomes opaque, and the vitreous humour exhibits a brownish hue. The disease is usually regarded as incurable.

Glaucoma.

By *Glaucoma* is understood an amaurotic state of the eye ; with a greenish opacity, behind the pupil, concave, and deeply seated. According to some, this state is mainly attributable to affection of the retina ; according to others, the choroid coat is chiefly to blame ; while a third class are of opinion that a change in the lens and vitreous humour is the principal cause of the disorder. It is probable that all these textures are more or less involved. The choroid coat is in a congested state, and the pigmentum nigrum would seem to

undergo alteration as to both quantity and quality. The retina is impaired in function, and may be altered in structure ; the vitreous humour is redundant and turbid ; and the lens may become slightly opaque. The prominent and characteristic symptoms are, impairment or loss of sight, permanent dilatation of the pupil, and green discolouration of the interior of the eye. Diagnosis from cataract is made easy, by observing that the opacity is more deeply seated than the lens ; and that it becomes indistinct, or even invisible, when viewed laterally. The catoptrical test shows the three images of the candle at first ; by and by the middle inverted one is extinguished ; but the deep-seated erect image remains throughout, and is always unusually distinct.

At the commencement of the disease, very decided amendment may sometimes be obtained by local depletion, counter-irritation, alteratives, and a mild mercurial course. If gouty or rheumatic symptoms co-exist—as is not unfrequently the case—the ordinary appropriate treatment is directed against that particular depravity of system. The advanced form is incurable. The disease seldom occurs, except in those of mature age ; and often may not unreasonably be regarded as a part of senile decay.

Ophthalmitis.

This term, in its correct acceptation, denotes involvement of the entire globe of the eye in inflammatory action—an affection of much danger to structure and function, as can be readily understood ; and one which demands the most careful and active treatment. The ordinary results of the inflammatory process are liable to occur ; effusion, giving tension and increased bulk ; exudation, inducing change of structure ; suppuration ; ulceration ; sloughing.

Wounds of the Eyeball.

These are perhaps the most common causes of acute ophthalmitis. And, accordingly, their treatment must be warily conducted to avert disastrous results. If foreign matter lodge in the interior of the eye, antiphlogistics will avail but little,

so long as such lodgement exists ; the globe will suppurate, open, and collapse. It is an important indication, therefore, to ascertain the presence and site of a foreign body, and to effect its removal. But the same difficulty is encountered as in the case of the brain. It is difficult to ascertain either the site or presence of the foreign matter ; and, even when these are plain, it is often very difficult to effect removal, without the most serious injury of the implicated parts. In regard to prognosis, it is important to bear in mind, that there may be foreign matter in the interior of the eye, without any apparent solution of continuity in either the cornea or sclerotic. For, the elasticity of texture may at once close the chasm in the latter tunic, and conceal it from even minute inspection.

Entozoa.

The *Filaria medinensis* has been found beneath the conjunctiva ; the *Filaria oculi humani* in the lens. In the latter texture, also, have been found the *Monostoma lentis*, and the *Distoma oculi*. The *Cysticercus telæ cellulosæ* has more than once occupied the anterior chamber ; it may be removed, by section of the cornea.

Tumours.

The eyeball is especially liable to be the seat of two kinds of tumour ; both malignant—the medullary, and melanotic. Carcinoma is rare ; when it does occur, the usual course is followed. The medullary tumour is most common at an early age, and seems usually to originate in connexion with the optic nerve ; growing from the bottom of the eye, occupying the chamber of the vitreous humour, and rapidly making its way externally. Loss of vision is early and complete ; the tumour can be seen dimly, through the pupil ; and the pain, cachexy, and other signs of the medullary tumour are present to testify of its character. (*Principles*, p. 550.) When the coats of the eye have given way, the tumour increases more rapidly than before ; a fungus is thrown out ; and this may assume the hæmorrhagic tendency. The end is death. Cure can be attempted in but one way, and that only at an early period—

by extirpation of the eyeball. In the advanced stage, all operative interference is contra-indicated ; reproduction is certain ; and the progress of the disease, instead of being arrested or retarded, is likely to become accelerated. Indeed, the cases are but few in which the operation has proved thoroughly successful—immunity from return remaining permanent and complete. Lately, I had occasion, on account of false aneurism at the bend of the arm, to tie the humeral artery of a gentleman aged 33, who, at the age of nine had undergone extirpation of the eyeball on account of medullary tumour ;* and in him there has never been the slightest symptom of return.

The melanotic tumour may occur *per se* ; slowly filling up the interior of the eye ; seen dim, black, and bulging, through the pupil ; ultimately thinning the coats, and forming dark coloured external projections ; attended with pain, tension, and early loss of vision. In some cases, care is required not to mistake the disease for simple staphyloma of the sclerotic. Most frequently, however, the medullary formation is associated with the melanotic ; and the progress and general character of the growth are those of the former class of tumour.

Extirpation of the Eyeball.

This operation may be required on account of tumour of the eyeball ; tumour of the orbit, involving the globe secondarily ; cancerous ulceration of the eyelids, involving the globe, or destroying the whole of the eyelids—as formerly explained, (p. 86.) The commissure of the eyelids having been divided, at each angle, so as to afford space, the outward prominence of the swelling is laid hold of by a volsella ; and by this instrument the part is steadied and directed, throughout the remainder of the procedure. A straight bistoury is entered at the margin of the orbit, and made to move round, so as to include the whole orbital contents in detachment from the bone ; the point, however, being moved very carefully at the bottom, lest perforation of the attenuated orbital plate should occur. The optic nerve is then cut across, and

* *Edinburgh Medical and Surgical Journal*, Vol. xix. p. 51.

the tumour withdrawn. If there be reason to suspect unusual attenuation of the bone—perhaps partial deficiency—it were no unwise precaution to effect the deeper incisions by a probe-pointed bistoury. If the lachrymal gland have escaped the general removal, it is seized by a hook, and dissected away. Then, having become satisfied of the entire removal of the diseased structure, the cavity is sponged clear of blood; and, dossils of dry lint or charpie having been rapidly placed so as to occupy the orbit and project somewhat beyond the margin, a retaining bandage is passed around, with sufficient firmness to arrest bleeding from the ophthalmic vessels. After a few days, the dressing is gradually undone and removed; suppuration is established; granulation succeeds; and the granulating wound is to be treated in the ordinary way. After cicatrization, an artificial eye may be adapted to the socket. Or, by division of the levator palpebræ muscle, permanent closure of the eyelid may be secured, so as to conceal in some measure the deformity.

Congenital deficiency of the Eyeball.

An interesting example of this occurred to me some years ago. A girl, strumous, and of strumous parentage, laboured under strumous conjunctivitis, which proved very obstinate, and had already produced considerable opacity of both corneæ. The mother, naturally of an anxious temperament, had her every thought engrossed by the state of this child—then an only one. She became pregnant; and still persevered in her watchful nursing unweariedly, and, if possible, with an increased solicitude. The second child was born at the full time. It proved a male, well-formed, and seemingly perfect in every way. But, on opening the eyelids, not a vestige of either eyeball could be found. The lids were perfectly normal in both form and size, but gave no sign of globular projection beneath; and on opening them, a red, fleshy, mucous-looking membrane, flat and loose, was found to be the apparently sole occupant of the orbit. As the child grew, there was no orbital development. The congenital deficiency remained unaltered.

Strabismus.

Squinting may affect one eye, or both. Very frequently both are implicated ; but one only in a minor degree. The immediate cause obviously depends on an inharmonious action of the recti muscles. One may act excessively, while its antagonist retains quite its normal character ; and displacement is effected by the former. Or—as there is good reason to believe more frequently happens—one retains its normal condition, while the other is enfeebled, or altogether paralyzed ; and displacement is, again, by the former. The ordinary varieties of squinting are, the *Convergent*, looking inwards ; the *Divergent*, looking outwards. The former is by much the more frequent.

Of late, a great advance has been made in the treatment of this deformity, by having recourse to section of the muscle on the side to which the displacement is—an operation suggested by Stromeyer, and first performed by Dr. Pauli of Landaw. The patient is steadied, as for other ophthalmic operations. The eye which is not the subject of operation is closed ; and the patient is made to turn the affected organ in the direction opposite to that of the squint. A fold of conjunctiva, between the cornea and the angle of the eye, but nearer to the latter than to the former, is then seized and elevated, by means of common dissecting forceps ; and is divided by a stroke of knife or scissors. By one or two touches of the scissors, aided by the forceps, the subconjunctival cellular tissue is cut, and the muscle exposed—at that point where it ceases to be fleshy and begins to be tendinous. It may either be gathered up by the forceps, or elevated by a blunt and curved probe passed beneath. It is then divided completely. And it is well to make, at the same time, a clean dissection of the sclerotic, for some little distance on either aspect of the muscle ; so as to divide any bands of fibrous or cellular tissue, which might otherwise act retentively on the malposition of the eye. If the organ prove unsteady during the operation, it may be expedient to control

its motions by means of a sharp, short, double hook, inserted into the sclerotic conjunctiva, at a safe distance from the corneal margin. The operation over, and all instruments withdrawn, the patient is directed to look as he formerly squinted. If he find a difficulty in re-effecting the displacement, the immediate result of the operation may be considered fully attained. But, otherwise, it is necessary to make a more free division of the textures implicated. In all cases, however, taking care not to occasion an unseemly exophthalmos, by carrying such division to an undue extent. The eye is covered up for a day or two ; and moderate anti-phlogistics are enforced. Untoward vascular action very seldom occurs. The wound may unite by adhesion. More frequently, it heals by the second intention. Sometimes a fungating amount of granulation forms ; this is removed by knife or scissors, and is subsequently repressed by gentle escharotics. After a few days, the functions of the eye are resumed. And they should be so arranged as to give the organ a habitual movement in the direction opposite to that whereto it was formerly directed. Indeed, this exercise or training of the eye, subsequently to the operation, is a very essential part of the treatment ; and should be begun at an early period after the operation—almost immediately ; otherwise an improper reunion of the divided muscle may take place, and maladjustment of the eyeball be restored. Occasionally the cure is more than complete ; a squinting in the opposite direction being threatened. And were the other rectus muscle now to be divided, an unseemly projection of the eyeball could not fail to be produced. Fortunately, it is often sufficient to excise merely a portion of the conjunctiva near the cicatrix of the wound ; the contraction of this new sore, in healing, tending to restore the normal position.

Sometimes it is sufficient to operate on one eye only. Very frequently we are compelled to operate on both. For, when both eyes are implicated in squinting—though in very unequal degrees—it will be found quite impossible to restore parallelism in position and motion, if the myotomy be limited to that organ which is most prominently affected—let the division be as extensive as it may. When the procedure

proves in all respects successful, deformity is not only removed ; the function of sight is also materially benefited.

But all squints do not require myotomy. According to cause and circumstance, the treatment varies.

Strabismus may be congenital. During early adolescence, attempts are to be made to remedy the evil by due exercise or training of the organ ; when one only is affected. The sound eye is covered up, for some hours in the day ; and the other, employed exclusively, may in time be compelled, as it were, to look straight upon the objects of sight. But care must at the same time be taken, that the sound eye do not suffer from undue confinement and disuse. Or a pair of spectacles, or goggles, may be worn occasionally, through which the patient cannot see with both eyes, unless they are directed in a parallel and normal manner. When such means fail, myotomy is had recourse to.

Squinting not unfrequently is the result of imitation. This must be corrected by breaking off the habit, and removing the patient from circumstances likely to induce its repetition ; also by the remedial exercise of the organ just noticed. And the like treatment is available, when squinting has been induced by the presence of marks on the nose or cheek, to which the eyes are from time to time strainingly directed ; when it has followed on a long confinement of the patient to one posture, perhaps constrained ; when it is the result of using one eye habitually and painfully directed on small objects, as in certain mechanical professions.

In children, squinting is not unfrequently connected with gastric and intestinal irritation ; and is remediable quite, by purgatives, alteratives, or anthelmintics. In such cases the strabismus is almost invariably convergent ; as can be readily understood, when it is remembered how closely the sixth pair of nerves are connected with the sympathetic. Sometimes squinting is but a sign of general disorder in the system ; and disappears, along with the other symptoms, under appropriate constitutional treatment. At any age, it may be the concomitant of important cerebral disorder.

Not unfrequently, squinting occurs as a sequela of some infantile disease. In such cases, the affection is quite of an

atonic character ; and may be mitigated—perhaps removed—by a general tonic system of treatment, by the application of strychnia to the temple and forehead, or by the passing of electro-magnetism through the part.

As a general rule, the operation should not be performed, until other means, likely to prove remedial, have been found insufficient. And in the case of the female, near the age of puberty, the operation should always be withheld, until the catamenia have appeared ; inasmuch as, on this occurrence, a rapid amendment and removal of the deformity is by no means unlikely to occur.

CHAPTER VI.

AFFECTIONS OF THE NOSE.

Fracture of the Nasal Bones.

FRACTURE of the nasal bones is the result of external violence, directly applied. It may be either simple or comminuted ; and the latter form is of frequent occurrence. It may be either simple or compound ; and the latter form may be constituted by wound of the integument, or by laceration of the internal mucous membrane, or by a combination of both circumstances. Deformity, by displacement, is a very prominent feature of the injury ; the slightest manipulation suffices to detect crepitation ; and this sensation is often greatly extended, by an emphysematous condition of the cellular tissue, in those cases in which the lining membrane has sustained greater injury than the integument. Swelling and discolouration occur, to a greater or less extent ; and usually pass laterally and downwards, to the eyelids and cheek.

Replacement is easily effected, by passing a pair of small dressing forceps, or the ordinary polypus-forceps, shut—or a goose-quill, blow-pipe, director, or female catheter—into the upper part of the nostril ; pressing outwards with the instrument, so as to restore the normal position of the fragments ; and at the same time modelling them into their proper place

by the fingers of the other hand applied externally. Sometimes, indeed, it may be in our power to improve on the original elevation, and to impart to the organ a more pleasing contour than it originally possessed. If any small fragments be completely detached and exposed, they should be at once removed. No retentive apparatus is necessary ; for, re-displacement is not likely to occur, unless under re-application of external violence. But if bleeding prove troublesome from the membrane, it may be necessary to plug the nares gently with lint. If there be a wound of the soft parts, it is treated according to ordinary principles. And, in all cases, the requisite precautions are put in force against the accession of over-action, and the risk of erysipelas.

Lipoma of the Nose.

By this term is understood a hypertrophied condition of the integument and subcutaneous adipose tissue of the apex and alæ ; seldom occurring but in the male, of advanced years, who has lived freely. When the enlargement is partial and of no great bulk, no direct surgical interference is required. It is sufficient to attend to regimen, and to the state of the general system ; so as to prevent, if possible, further growth. But when the growth is large, it proves a serious inconvenience ; interrupting vision, and interfering unpleasantly with the spoon and the wine-glass ; and, in consequence, surgical aid may be asked, and granted. The redundant growth is to be carefully pared away. A finger having been placed in the nostril, so as to distend the part, and facilitate dissection—while, at the same time, division of the cartilage is provided against—the scalpel and forceps are carefully used, so as to remove the whole of the changed integument. The bleeding is considerable ; but is quite capable of arrest by cold, pressure, and ligature. Sometimes the parts are so dense as to preclude the ordinary use of the ligature ; in which case, if pressure fail, the curved needle is to be employed. (*Principles*, p. 506.) Cicatrization is tardy ; but, when obtained, is satisfactory. Apparent reproduction may take place, by growth from the surrounding integument, formerly

unaffected ; but the cicatrix itself usually remains firm and depressed.

Polypus of the Nose.

Nasal polypi are of various kinds : simple mucous, and cysto-mucous ; fibrous ; and medullary. (*Principles*, p. 577.) The first are, fortunately, of most frequent occurrence ; and, usually, are found adherent to the investing membrane of the superior turbinated bones.

The symptoms of the common mucous polypus are sufficiently characteristic. The patient feels that something unusual, and apparently fleshy, is occupying the nostril ; calls to blow the nose are unusually frequent, and can be but imperfectly obeyed—passage of air through that nostril being found to be very much obstructed ; there is a preternatural amount of mucous discharge from the part ; on attempting to blow the nose, a great portion of the mucous secretion is thrown into the pharynx ; there is a constant feeling as if there existed “ a cold in the head ;” very frequently, there is lachrymation, the extremity of the nasal duct being compressed by the growth, or the lining membrane of the duct being, sympathizingly, involved in congestion ; and these uncomfortable circumstances are all aggravated in damp and variable weather. On looking into the nostril, the tumour is seen ; and, when the speculum is used, a very distinct exploration of its size and form may in most instances be effected. When the mass has attained to some considerable size, it renders itself apparent, by projecting on the upper lip. As it enlarges backwards, deafness may be produced, by pressure on the Eustachian tube ; and giddiness may be occasioned, by compression of the jugular. The sense of smell is necessarily much impaired ; so, often, is that of taste. Speech is indistinct, and snuffing. In sleep, the patient is a habitual and sonorous snorer. After a time, the countenance may undergo a formidable change ; the nasal bones becoming gradually disjoined and expanded ; giving a very unpleasant breadth to this part, and establishing the condition which is ordinarily termed “ Frog’s Face.” Then—and often, also, at an early

period of the case—pain is complained of in the head, especially in the forehead.

In the minor cases, it is essential that diagnosis be accurate. Symptoms are not trusted to alone. The speculum must be employed, so as to expose the nasal cavity; enabling us to ascertain whether the obstruction depends on nascent polypus or not. For the disease is apt to be simulated. There may be merely a general congestion of the lining membrane. Or there may be a bulging of the septum to one side, with or without congestion of the membrane on the convexity of the bulge. There may be abscess forming between the septum and its investing membrane. Or there may be a hypertrophied condition of the inferior spongy bone. Any of these circumstances may produce more or less occlusion of the nostril, increase of discharge, snuffling of speech, and most of the ordinary symptoms of polypus. By the use of the speculum only can the true condition of parts be determined. If there be no polypus, no forceps are required. For congestion, abstraction of blood and astringent lotions are sufficient. Abscess of the septum may be prevented by leeching; when formed, it requires evacuation. Displacement of the septum, and enlargement of bone, require no direct interference.

Removal of the common polypus is effected by twisting and evulsion. (*Principles*, p. 577.) Care is taken to apply the forceps accurately to the neck of the tumour, so as to ensure removal of the entire mass; and gentleness is used, so as not to endanger avulsion of bone. The forceps are well teathed, firmly jointed—and secured by a pin between the blades, so as to prevent them passing each other during the twisting movement; strong, yet not so bulky as those commonly in use—less than the “dressing forceps” of the ordinary pocket-case. The tumours being generally numerous, more than one operation is usually required, to effect eradication of the whole; and of this the patient should be warned in the first instance, to prevent disappointment. After temporary clearance of the nostril has been effected, the cavity is plugged with lint; to arrest bleeding, and prevent the access of cold air to the raw surface. A second operation is not attempted, until the inflammatory results of the former have completely subsided.

After the nostril has been finally cleared, the use of an astringent is advisable—such as a solution of zinc, nitrate of silver, or alum—so as to prevent reproduction of polypous growth, and restore the mucous membrane to a sound condition. The following form is often found very suitable: Sulph. Zinci half a drachm, Tinct. Gallarum one drachm, Water eight ounces.

If evulsion be found to cause inordinate pain, with inflammatory symptoms, the attachments of the polypi may be severed by probe-pointed scissors or knife.

The dense fibrous polypus, when originating from the posterior part of the nasal cavity, projects backwards, is of a somewhat pyriform shape, and hangs pendulous in the fauces. For removal of such a tumour, the use of ligature is most suitable. A long double loop of wire, catgut, or strong cord, is passed through the affected nostril. The noose is caught, as it appears in the posterior fauces, by forceps introduced through the mouth. And then, by fingers or forceps, the loop may be carried over the fundus of the tumour; so that on drawing the ends hanging out of the nostril, the noose may be run tight upon the upper part of the growth. This having been done, the nasal ends are passed, separately, through a double silver canula, which is then pushed into the nostril until its extremity rests on the polypus. By pulling the ends, the noose is now completely tightened, so as to strangulate the mass at its attachment. And the ends, drawn tightly, are secured through rings placed for this purpose at the anterior extremity of the canula. From time to time, a renewal of the tightening may be had recourse to. The tumour at last drops away, and is either swallowed, or coughed up and discharged by the mouth.

Sometimes, however, the noosing of the mass cannot be so easily accomplished. The double ligature having been passed as before, the loop hanging out of the mouth is divided, so as to constitute two single ligatures. The oral end of one is passed through a long single canula, and is carried carefully under the base of the tumour on one side. In the same way, the corresponding end of the other ligature is managed; so that this ligature passes round the tumour on the opposite side. The directing canula having been then withdrawn, the

double form of ligature is restored, by uniting the oral ends in a firm knot. The nasal ends are now drawn ; and the noose is run tight on the tumour, at its upper part, as before.

But a dense and firm polypus may occupy the anterior part of the nares ; broad in its attachment, and firmly united with both periosteum and bone. Such tumours experience has declared to be very prone to degeneration ; early becoming very vascular, softening, and ultimately assuming the medullary character. Removal therefore is highly expedient ; and, to be effectual, it must be both early and complete. Ligature will not suffice. The morbid structure must be cut out, along with the parts from which it springs, and with which it is intimately incorporated. The operation is formidable and severe—but not the less expedient. No fixed rules can be given to guide the operative procedure. It may be possible to disclose the tumour and its site sufficiently by simple incision of the nostril. Or it may be necessary to remove a portion of the superior maxilla.*

The *medullary* and malignant nasal polypi may without doubt be regarded as incurable. By the time the case has been submitted to the surgeon, the morbid structure has so extended as to render its entire removal, by any feasible operation, impracticable ; and we content ourselves with palliation. If much distress be occasioned by occlusion of the nostril, the soft obstructing mass may from time to time be pushed away by the finger or probe ; but even this interference must be very carefully practised, lest troublesome hæmorrhage ensue. Also, let us beware of mistaking protrusion and pointing of the tumour, at the internal canthus, for fistula lachrymalis—about to form. (P. 100.)

Epistaxis.

By this term is understood, an inordinate hæmorrhage from one or both nostrils. It may be the immediate result of the operation for polypus ; it may follow external injury, with or without fracture of the nasal bones ; it may be one of the untoward results of medullary formation, within the nasal

* *London and Edinburgh Monthly Journal*, 1842, p. 791.

cavity, or connected with it ; it may be a critical depletion, of natural occurrence, tending towards resolution of an inflammatory process ; or it may be the consequence of a passively congested and hæmorrhagic state of the schneiderian membrane. The common bleedings of the nose, in adolescents, caused by plethora, and tending to relieve the system from that unsafe condition, scarcely come under the designation of epistaxis ; usually the bleeding is not inordinate, is in all respects safe and beneficial, and certainly requires the adoption of no means for its arrest.

Our first duty when called to a case of alarming hæmorrhage from the nose, is not at once to attempt its arrest ; but to determine whether such an attempt be advisable or not. If the bleeding be habitual, in a robust and plethoric patient, not very far advanced in years—if it be at all critical in its history, as connected with an inflammatory attack advancing in some adjacent part—if we are told that the patient has been subject to giddiness, or other affections of the head—we are certainly not to interfere, unless evident signs exist that a greater amount of blood has already flowed than the system can well bear, and that further loss would probably be attended with hazardous consequences. Then—but not till then—we endeavour to prevent continuance. The patient's head is elevated, and cold applied—to the nose, forehead, and back of the neck. All stimuli are forbidden, and absolute rest and quietude enjoined. This treatment failing, astringents may be taken into the nostril, and applied to the bleeding surface, by injection or by insufflation—Ruspini's styptic, a solution of zinc or alum, turpentine dilute, powdered gall nuts, &c. And this method of arrest may be assisted by obstruction of the anterior nares ; either by compression, or by stuffing the cavity firmly with lint, after the styptic has been sufficiently applied. Lately, it has been proposed to elevate the arm, or arms, and to retain them raised above the head ; and certainly this proceeding would seem occasionally to contribute, at least, towards the successful result ; perhaps in consequence of greater power being required to propel the arterial blood upwards in the arm, and less consequently being expended on the carotid circulation—as the originator,* Dr.

* *Archives Generales de Médecine*, June 1842.

Negrier, imagines ; or perhaps in consequence of the increased facility of venous return in the subclavian vein "hurrying the return-blood in the jugulars, and thus deriving from the bleeding vessels of the nose."

When such minor means fail to arrest, it is necessary to plug the nares, both anteriorly and posteriorly. A long stout ligature is passed through the nostril into the mouth ; by means of a flexible bougie, a loop of wire or catgut, or a springed instrument made for the express purpose. To the upper part of the oral extremity of this ligature, a portion of sponge or a dossil of lint is attached, of sufficient size to occlude the posterior opening of the nostril ; and by withdrawing the nasal extremity of the ligature, this obstructing substance is firmly impacted ; the extremity of the oral portion of the ligature remaining still pendent from the mouth. The anterior nostril is then filled with lint, pushed firmly from the front. After three or four days have elapsed, the apparatus is removed, gently. The anterior plug is withdrawn by means of forceps ; the posterior is extracted by pulling the oral extremity of the ligature, previous dislodgement, if need be, being effected by the cautious pushing of a probe passed through the nostril. Sometimes it is necessary to plug both nostrils ; but, generally, the hæmorrhage proceeds from one only. Constitutional treatment is not forgotten ; more especially if there be reason to suppose that a hæmorrhagic tendency exists in the system. (*Principles*, p. 513.)

When syncope has occurred from epistaxis, in an elderly patient predisposed to head affection, we should be very careful not to excite premature and excessive reaction, otherwise extravasation within the cranium is not unlikely to occur. The head is not to be placed low, as in restoration from ordinary syncope, but should be kept elevated ; and stimuli should, if possible, be avoided.

The passing of Nasal Tubes.

Flexible tubes may be readily enough passed along the floor of the nostrils into the posterior fauces ; and thence they may be directed into either the larynx or œsophagus, as circumstances may require. The former destination is necessary

in attempts to restore breathing, in cases of suspended animation ; the latter, in order to introduce nutritive ingesta into the stomach—as in cut throat. If, in the latter case, the tube is to be left permanently inserted, the passage by the nose is plainly preferable to that by the mouth ; avoiding profuse salivation, and much discomfort.

Foreign Bodies in the Nostrils.

Foreign bodies may lodge accidentally in the nasal cavities ; more frequently they are introduced wilfully, by the young and inconsiderate ; peas, beads, portions of pencil, and such like substances are very commonly inserted by the thoughtless child. On the foreign body decidedly disappearing inwards, the patient is alarmed ; and probably makes desperate efforts to extrude it by the fingers, but with the effect only of pushing it further into the nostril. The parent or nurse is now made aware of the circumstance, and by them similar efforts at dislodgement are made, again with the effect of causing a deeper lodgement. By this time the foreign substance is beyond the reach of the eye ; and its site is further obscured by the slight bleeding which has probably taken place during the abortive efforts at extrusion. And, in this condition, the surgeon finds the case. It is well, in the first instance, to inject a stream of warm water into the nostril ; it clears away coagula, loosens the foreign body, and may effect its expulsion. Then the probe is to be used, the patient's head having been firmly secured ; and the best way of accomplishing this, in the child, is to place the head firmly between the knees of the operator. By the probe, used gently, we first ascertain the presence and site of the foreign substance—for it may have passed outwards, by the mouth, or downwards by the pharynx. Having discovered the foreign body, the flat end of the probe, slightly bent, or the scooped end of a director, or a curette made for the purpose, is passed down upon it, and insinuated past it ; then, by raising the handle of the instrument, and bringing the point to bear upon the posterior aspect of the foreign substance, the latter is dislodged forwards ; and, by a second application of the instrument, it may be readily removed. Forceps, however slim, are very

likely to fail. They seize the anterior part of the body only ; and, slipping, have the effect of causing a firmer and deeper impaction.

Congestion of the Schneiderian Membrane.

The lining membrane of the nostrils is liable to become the seat of a minor vascular action ; chronic, and unimportant as regards structural change ; but troublesome and inconvenient by its continuance. There are redundancy of secretion, uneasy sensation, and a feeling of stuffing in the part ; not unfrequently the tone of voice is considerably impaired, and the sense of smell may also be rendered imperfect. Many of the symptoms of mucous polypus are present ; and careful exploration by the nasal speculum is necessary, to ensure accuracy of diagnosis. If the action be at all of an acute nature, a few leeches may be required, once and again—applied directly to the membrane by means of a suitable glass tube ; in the passive form of congestion, leeching may also be expedient, once, to unload the vessels of the part. Then astringents are employed ; solutions of nitrate of silver, sulphate of zinc, chloride of soda, alum, &c. ; and these are patiently persevered with, either singly or combined. But in all cases an especial regard must be had to the state of the general system. Usually an atonic condition is found ; and the greatest benefit is derived from a sustained exhibition of the chalybeates. In very many cases, indeed, without this tonic general treatment, all local care would prove of but little avail.

Abscess of the Septum Narium.

Abscess may form beneath the mucous covering of the septum ; and, when acute, the inflammatory action which causes it is usually the result of external violence. The chronic form may be independent of all apparent exciting cause, occurring in a patient of broken-down system—probably a victim of the mercurio-syphilitic taint. The bulging swelling is apt to simulate the growth of polypus. During the nascent stage, leeches are to be applied to the part, and other suitable antiphlogistics employed, to prevent suppuration if possible.

When matter has formed, an evacuating incision cannot be made too soon, in order to save the cartilage ; otherwise great deformity may ensue, by a falling in and shrinking of the most prominent part of this important feature.

Ulcers of the Nostrils.

1. *Simple ulceration* of the schneiderian membrane is liable to occur from the ordinary exciting causes of ulceration of mucous tissue ; exposure to cold, the contact of acrid matter, the irritation communicated from diseased teeth, &c. The treatment accordingly consists, first, in the removal of the exciting cause ; seclusion from atmospheric exposure, discontinuance of snuff-taking, removal of diseased teeth or stumps in the upper jaw. And then, according as the ulcer manifests the inflamed, irritable, or weak characters, the applications are bland and soothing, or nitrate of silver in substance or solution, or various gently stimulant lotions.

2. *Mercurio-Syphilitic ulcers* not unfrequently form in this situation ; of a secondary, or, more commonly, of a tertiary character. They are of an obstinate nature, and likely to resist all mere local treatment. The more important remedial agents are those which affect the system ; especially the iodide of potassium and sarsaparilla.

3. *Ozæna*.—By this term is understood an unhealthy ulceration of the lining membrane of the nose, with affection of the subjacent bone—caries, necrosis, or both combined. The discharge is profuse, and offensive ; the ulceration tends rather to spread than to heal ; portions of bone from time to time come away ; the nose sinks inwards, and is more or less deformed ; both articulation and respiration are interfered with ; and ultimately the general health may seriously give way. The nasal bones themselves may perish and exfoliate ; and then the deformity is not only great but almost irremediable. The peculiarity of this ulcer is, that the ulceration is of a spreading character—simply acute, or slowly phagedænic ; and that the bones are more or less extensively involved. In the adult, few examples will be found, in which the abuse of mercury, for syphilitic or other ailments, cannot

be traced out as the paramount cause. In children, the affection would seem to be connected with the strumous cachexy.

The treatment is mainly constitutional ; as in the simple mercurio-syphilitic sores, without affection of bone. Besides the iodide of potassium, and sarsaparilla, arsenic is found a very useful internal remedy—steadily persevered with, in small doses. In obstinate cases, benefit has sometimes resulted from exhibition of the liquor hydriodatis arsenici et hydrargyri—a powerful alterative.* The local applications are necessarily varied. At first, bland and tepid injections are advisable ; afterwards the applications are stimulant and alterative. A weak solution of arsenic, solutions of the nitrate of silver, sulphate of zinc, &c., may be employed, as circumstances seem to indicate. Throughout the cure, the chlorides should be used, at least occasionally, as correctives of fœtor. By some, the following combination is held in high repute : an injection composed of from one to two drachms of chloride of lime, rubbed up with thirteen ounces of decoction of rhatany root—strained after standing half an hour. In scrofulous cases, the ordinary antistrumous constitutional treatment will, of course, not be neglected.

4. *Lupus*, or *Noli me tangere*, is a confirmed phagedænic ulcer ; commencing usually in the upper lip, or at the exterior of the nasal cavity ; spreading upwards, inwards, and around, but more in breadth than in depth ; often healing at one part, while it extends at another ; ultimately involving the bones, denuding them, and inducing, by caries or necrosis, such deforming results as at an earlier period follow on ozæna. In advanced cases, the soft parts of the nose, and not a little of the hard, may be wholly destroyed ; while an unseemly chasm has also been made in one or both cheeks. The destructive action may proceed still more extensively, producing deformities more and more hideous, and ultimately proving fatal by hectic exhaustion. The disease is most common in advanced adolescents—of the poorer sort, ill-fed, ill-clothed, scrofulous, or already tainted in system by mercury, and too probably already given to habits of intemper-

* *Dublin Journal of Medical Science*, September 1840, p. 98.

ance. As in other phagedænic ulcers, the action may be either chronic or acute. (*Principles*, p. 244.)

The treatment is partly constitutional—such as recommended in ozaena; partly local, consisting of such applications as are found most suitable for arrest of phagedæna, (*Princ.* p. 246.) Nitric acid, or nitrate of mercury, is first employed; and then the sore is subsequently treated according to the characters which it presents. When it threatens to become irritable, and verges again towards phagedæna, a weak solution of arsenic is found of much service. Sometimes repeated leeching is useful. To remove caries of bone, and expedite exfoliation, chloride of zinc is applied, in the form of paste. Occasional use of the simpler chlorides is as essential as in ozaena. After arrest, and cicatrization, the greatest constitutional care is still required; otherwise reaccession of the disease is extremely probable.

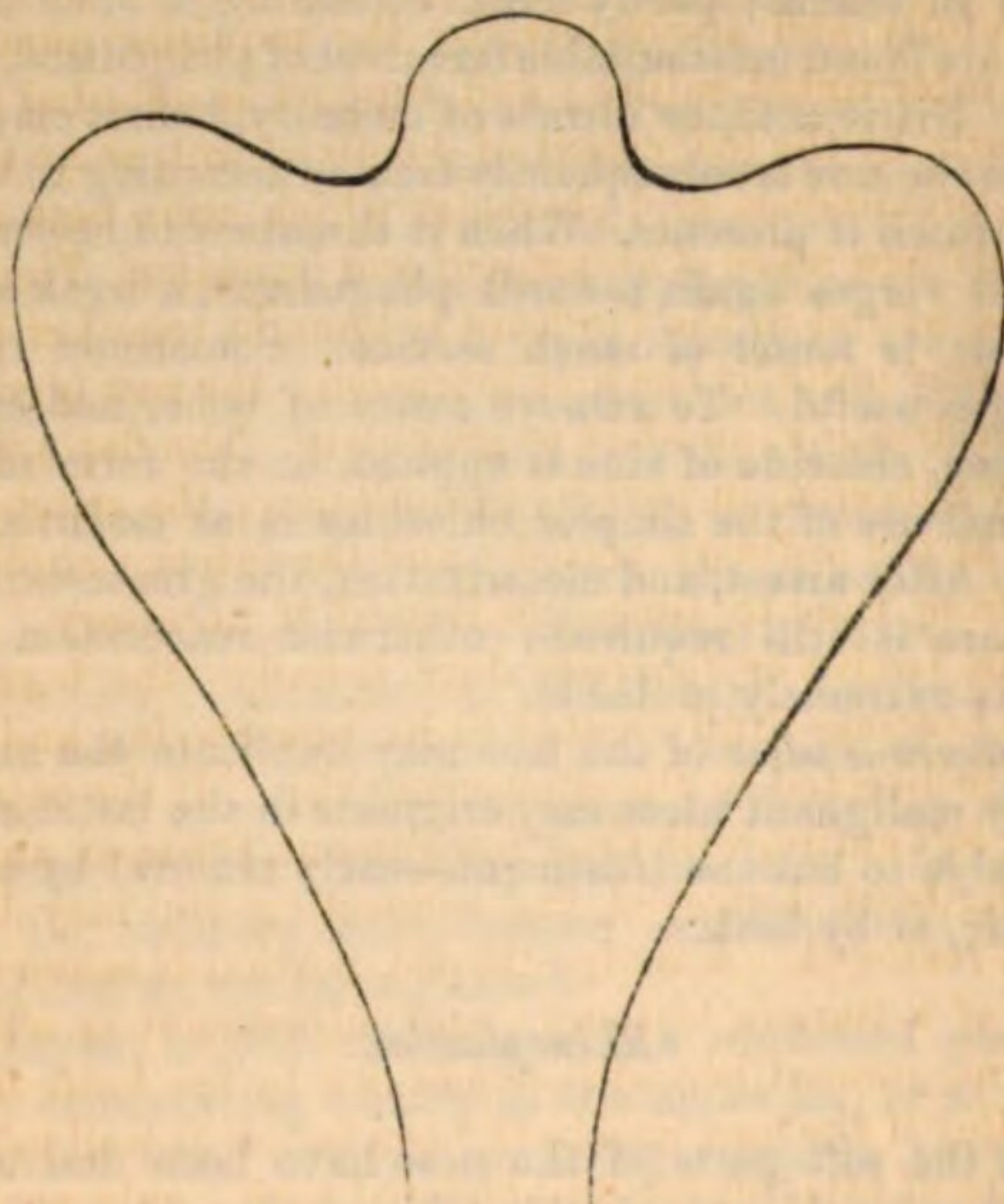
5. *Cancerous ulcer* of the face may implicate the nose; or the truly malignant ulcer may originate in the latter site. It is amenable to but one treatment—early removal by knife or escharotic, or by both.

Rhinoplastics.

When the soft parts of the nose have been destroyed in whole or in part, by wound, ulceration, or sloughing, they may be restored in some measure, by transplantation of an atoning amount of cutaneous and subcutaneous tissues, borrowed from an adjoining part. When ulceration has been the destroying agent, no restorative operation is ever to be attempted, until satisfactory evidence seem to have been afforded that not only has all ulceration ceased, but that it is not very likely to return on the application of a common exciting cause of inflammatory action. Under any circumstances, it is plain that the sequela of lupus presents a much less favourable prognosis, than when the cicatrix is the result of wound, or any other simple casualty.

When almost the entire organ has been removed, its restoration is attempted as follows:—A piece of card or leather is shaped of the required dimensions, to constitute new alæ and apex; the columna being left for an after proceeding. And

this outline of the new structure should always be rather too large than otherwise, tendency to shrivel by absorption being great after the flap has become fixed in its new locality. The



edges of the cicatrized sore, on which the borrowed flap is to be adjusted, are made raw by the knife. The outline of the flap is then laid flat on the forehead, the fundus pointing upwards, the neck resting between the eyebrows. It is there steadily held by an assistant, while the surgeon, with ink, or at once with the knife's point, draws its boundaries. Thus defined, it is carefully dissected down, of uniform thickness, until the narrow part is reached; and then the incisions are carried to a greater depth, to ensure an abundance of vascular supply. In no part of the wound is the pericranium interfered with; and, if possible, the flap should not be made to interfere with the hairy scalp—for very obvious reasons. The neck of the flap is made sufficiently long to admit of its being twisted, without serious interruption to the circulation; and, to facilitate this movement, the knife is car-

ried lower down on that side to which the twist is to be made. A little time is allowed for the oozing of blood to cease ; then the flap, having been twisted so as to bring the integument upwards, is adjusted to the rudiments of the old feature, carefully and accurately, by the requisite number of points of interrupted suture ; and support is afforded to the flap beneath, by the lodgement of dossils of lint, so as to give to it that prominence and character which seem best suited for it, in its new office of atonement and imitation. The lower part of the wound in the forehead is brought together by suture, and may unite by the first intention ; the rest is covered with water-dressing, and left to granulate. The flap adheres, in part by adhesion, in part by granulation ; the stitches are cut away at the ordinary period ; and the interior stuffing is changed from time to time—medicated if necessary. Ultimately—in twelve or fourteen days, usually—the borrowed substance becomes firmly seated in its new abode ; and then attention is directed to the connecting slip. If the ossa nasi have been left entire, with their integument, the apex and alæ only having been destroyed, the connecting slip may be divided and removed. A wedge-shaped portion is taken away by means of a narrow bistoury ; and adjustment is effected with the integument beneath—made raw by the knife for reception. But if the ossa nasi have been lost, it is well to leave the medium of attachment uninterfered with ; only securing its incorporation with the subjacent surface ; for, by its continued presence, the want of prominence which the loss of the nasal bones could not fail otherwise to ensure, will be very much compensated. Besides, the continued nutrition of the transplanted flap will be fully secured, and its shrivelling by atrophy may be in a great measure prevented. If the prominence should threaten to be excessive, it may be reduced by compression suitably applied.

Certain precautions are always to be attended to in such proceedings. As already stated, the flap should at first seem too large ; if neatly fitting at the time, it is sure to prove insufficient afterwards. Twisting is effected very gently and carefully, lest strangulation ensue. Should engorgement occur, relief is to be obtained for the passively congested vessels, by punctures, or by drawing blood from the still raw edges.

Erysipelas may supervene ; if it does, let not the transplanted part be exempted from puncture or incision, if these be deemed necessary ; for experience declares it to possess at least an equal tolerance of such remedial treatment as the original textures.

When consolidation of the new alæ and apex has been duly effected, formation of the columna is then proceeded with ; according to the method first proposed by Mr. Liston.* The centre of the upper lip is found tumid and elongated ; removal of a portion of the redundancy, would of itself be a considerable improvement ; and when the portion so removed can be converted to the useful purpose of constituting a most efficient new columna, the expediency of the proceeding becomes very apparent.

“ The inner surface of the apex is first pared. A sharp-pointed bistoury is then passed through the upper-lip—previously stretched and raised by an assistant—close to the ruins of the former columna, and about an eighth of an inch on one side of the mesial line. The incision is continued down, in a straight direction, to the free margin of the lip ; and a similar one, parallel to the former, is made on the opposite side of the mesial line, so as to insulate a flap about a quarter of an inch in breadth, and composed of skin, mucous membrane, and interposed substance. The frænulum is then divided, and the prolabium of the flap removed. In order to fix the new columna firmly and with accuracy in its proper place, a sewing-needle—its head being covered with sealing-wax to facilitate its introduction—is passed from without through the apex of the nose, and obliquely through the extremity of the elevated flap : a few turns of thread over this suffice to approximate and retain the surfaces. The flap is not twisted round as in the operation already detailed, but simply elevated, so as to do away with the risk of failure. Twisting is here unnecessary, for the mucous lining of the lip, forming the outer surface of the columna, readily assumes the colour and appearance of integument, after exposure for some time, as is well known. The fixing of the columna having been accomplished, the edges of the lip must be neatly

* *Practical Surgery*, p. 253.

brought together by the twisted suture. Two needles will be found sufficient, one being passed close to the edge of the lip; and they should be introduced deeply through its substance—two-thirds, at least, of its thickness being made superficial to them. Should troublesome bleeding take place from the coronary artery, a needle is to be passed so as to transfix its extremities. The whole surface is thus approximated; the vessels being compressed, bleeding is prevented; and firm union of the whole wound is secured. The ligature of silk or linen, which is twisted round the needles, should be thick and waxed; and care must be taken that it is applied smoothly. After some turns are made round the lower needle, the ends should be secured by a double knot; a second thread is then used for the other needle, and likewise secured. With the view of compressing and coaptating the edges of the interposed part of the wound, the thread may be carried from one needle to the other, and twisted round them several times; but in doing this, care must be taken not to pull them towards each other, else the object of their application will be frustrated, and the wound rendered puckered and unequal. Last of all, the points of the needles are to be cut off with pliers. No farther dressing is required. The needles may be removed on the third day; their ends are cleaned of coagulated blood, and, after being turned gently round on their axis, they are cautiously withdrawn, without disturbing the threads or the crust which has been formed about them by the serous and bloody discharge. This crust often remains attached for some days after removal of the needles; and, besides forming a bond of union, is a good protection to the tender parts. Some care is afterwards required, from both surgeon and patient, in raising up the *alæ*, by filling them with lint—thus compressing the pillar, so as to diminish the œdematous swelling which takes place in it, to a greater or less degree, and repressing the granulations. It is, besides, necessary to push upwards the lower part of the column, so that it may come into its proper situation; and this is done by the application of a small round roll of linen, supported by a narrow bandage passed over it and secured behind the vertex."

Partial Restoration of the Nose.

When a portion of either ala is destroyed, the deficiency may be readily supplied from the adjoining cheek ; if there be the ordinary fulness there. The flap is raised, transplanted, and has its vascular supply maintained, by conducting the operation in the same way as for restoration of the whole organ. The wound in the cheek may, generally, be approximated entirely ; and, in consequence, may be expected to unite by the first intention.

The entire ala may be restored in a similar way. But if the cheek be either naturally spare, or already occupied by cicatrices, the flap must be brought from the forehead. An operation is performed, similar to that for restoration of the whole organ, but on a minor scale. When the ridge of the nose is long, it is well to make a suitable furrow in its centre—by incision—for reception of the long connecting slip ; which, otherwise, finding itself but indifferently supported on the exterior of the nasal integument, might fail to afford due nourishment to the flap, and induce its sphacelation. After union has occurred throughout the whole wound, the connecting slip may be raised from its temporary bed, and the raw edges of its site may be approximated ; or it may be left undisturbed ; according as circumstances may seem to indicate.

Loss of the apex and both alæ is supplied by a frontal flap ; with, or without, lodgement of the connecting slip, according to the length of the nasal ridge.

The ridge itself, when deficient, may be restored, by a frontal flap, very readily and efficiently ; either by adapting a suitable portion to its surface, made raw ; or by inserting a slip into a sulcus made for its reception. By cutting out the depressed portion, and approximating the margins of the wound by suture, the depression may be removed, in some cases satisfactorily ; but, in most, such an attempt would be followed by an elevation of the apex, causing a deformity little less unseemly than the original.

When the columna alone is deficient, the operation for its restoration is performed, as detailed at page 172.

Not unfrequently, the columna, and the integumental part

of the alæ and apex, remain entire, while the cartilaginous texture has suffered more or less dilapidation ; and the nose, in consequence, shrinks, falls inwards, and is much deformed. Autoplasty is not required to remedy this case. In some examples, it is sufficient to divide carefully the anormal adhesions within, to elevate the nostrils then to their normal level, and to maintain this elevation subsequently by suitable stuffing of the cavities. In other cases, however, such manipulation is found insufficient ; and then it is expedient to approximate the cheeks, so as to force the nose into increased prominence ; the original insertions of the alæ on the cheek having been previously detached, by subcutaneous incision. The organ, thus rendered movable, is transfixed horizontally, by silver needles, which are made to perforate a piece of leather, or wood, after emerging from the nose ; and by twisting the extremities of the needles, on this exterior foreign substance, the due amount of approximation is effected and maintained.*

When there is both depression of the alæ and apex, and loss of the columna, the depression is first to be removed ; and then the new columna is to be constructed in the ordinary way.

But, in truth, no exact details can be established for any autoplastic or simply restorative operation on this organ ; the proceedings must vary, in almost every case, according to its peculiar circumstances. For further information on Rhinoplastics, the student is referred to the Practical Surgery of Mr. Liston, and the writings of Dieffenbach—who, in this department, bid fair to rival the fame even of Tagliacotius.

CHAPTER VII.

AFFECTIONS OF THE SUPERIOR MAXILLA.

Collection of Fluid in the Antrum.

The antrum is liable to become the seat of a chronic collection of fluid, whereby its parietes are expanded and attenu-

* FERGUSON'S *Practical Surgery*, p. 454.

ated, and its cavity much enlarged. The condition is ordinarily termed abscess ; but it seems very doubtful if this appellation be accurately applied. The fluid may be puriform, but is seldom purulent. It is more like what is usually found in serous cysts ; sometimes thin and serous, sometimes glairy, sometimes sanguinolent, sometimes puriform, not unfrequently mingled with more or less of solid curdy matter. The parietes are not thickened by fresh osseous deposit, as in chronic abscess ; on the contrary, they are simply expanded, becoming thin, and in some places perhaps deficient—the loss being supplied by membranous structure, contributed probably by the periosteum. In short, the morbid condition more resembles that of spina ventosa, or osteo-cystoma, than that of chronic abscess of bone. (*Principles*, p. 319.)

The symptoms are—uneasy sensation in the part ; swelling of the cheek, which ultimately crackles on pressure, and may be felt to fluctuate—the parietes having become much attenuated ; the palate may bulge considerably downwards ; sometimes there is increased secretion from the corresponding nostril ; and from the hanging and stiffness of the lip on that side, articulation may be slightly interfered with. The change may be attributed to a slight and remote injury ; or to the presence of decayed teeth in the corresponding maxilla ; but, very frequently, there is no assignable exciting cause.

The remedy is by evacuation ; and the aperture must be both free and dependent. An aperture sufficiently dependent may be formed in the corresponding alveoli, of the canine or first molar teeth ; and sometimes an aperture of communication is found already established there, on removal of the decayed teeth or stumps. But such an opening is seldom if ever sufficiently free, when of spontaneous formation ; indeed, sufficient space is not readily obtained at this part, even by operation. And it is essential that the opening shall be of some considerable size ; otherwise the fluid will not escape by it ; but will be retained by atmospheric pressure—as in the case of the narrow-necked bottle, filled with water, and suspended in an inverted position for barometric purposes. It is better to make the opening through the most dependent part of the attenuated parietes ; above the first molars. The membrane of the cheek is divided there ; and, by means of

the same instrument—a strong bistoury—the parietes of the cavity may also be perforated, in the greater number of cases. If the bone, however, be thick and resisting, a pointed lever, as used for the extraction of decayed teeth, may be employed. And an opening is made, of sufficient dimensions to admit the point of the little finger. Through this the contents drain away; re-accumulation is effectually prevented; and, by pressure from without, return to the normal state, by contraction, is favoured.

Abscess of the Antrum.

The lining membrane may undergo the inflammatory process, with or without the application of external violence; and suppuration may ensue. The action may be either chronic or acute. In the former event, the case will very much resemble the cystic enlargement just detailed. This form is of rare occurrence, and is usually unconnected with external injury. Acute abscess, on the contrary, is generally the result either of violence applied, or of great irritation communicated from decayed teeth, or other affections of the gums. The symptoms are severe. With a considerable amount of constitutional disturbance, there are deep-seated and great pain, tension and throbbing, and very considerable swelling of the superimposed soft parts. Usually spontaneous evacuation takes place, partially, by the side of a tooth; with relief from the more prominent symptoms. Such partial evacuation and relief, however, are not enough; the operation, as for evacuating the indolent fluid collection, above the bicuspid teeth, must be had recourse to. But, of course, we shall attempt, in the first instance, to forego the necessity of all operative interference, by timeously arresting the inflammatory process, if possible, by means of the suitable antiphlogistics, ere matter has at all formed. When the purulent accumulation has taken place, the artificial opening cannot be too soon established. From the turgid state of the membrane, it is very obvious that no partial relief can be expected from spontaneous escape through the nasal aperture—as sometimes happens in the indolent collection of fluid.

Polypus of the Antrum.

The lining membrane of this cavity may give origin to similar polypous formation as does that of the nostrils. But the occurrence of benign polypi here is comparatively rare. The medullary formation is not uncommon ; constituting the origin of osteocephaloma, as affecting this bone ; and amenable to the ordinary treatment. Were the indications plain of the existence of a benign polypus—mucous or fibrous—within the antrum, it would certainly be our duty to expose the cavity, by suitable incision, from the mouth ; with or without division of the lip ; and to eradicate the morbid growth thoroughly. Such cases, however, are extremely rare.

Tumours of the Superior Maxilla.

Two forms of tumour not unfrequently occur in this bone ; Osteosarcoma and Osteocephaloma. Tumours very different in themselves, and requiring very different treatment ; the one early irremediable ; the other capable of cure, at a remote date, and after a large or even enormous size has been attained. (*Principles*, p. 588.)

The osteosarcoma may reach a large size by external bulging, and by expansion of the bone ; but, unless it degenerate in structure, it remains limited within the confines of the superior maxilla ; and, consequently, by removal of that bone alone, the whole of the diseased formation may be taken away. The swelling projects into the fauces, into the mouth, and outwards on the cheek ; the main protuberance is in the last-named direction, interfering with articulation, mastication, and vision ; a thin serous discharge escapes by the mouth, seldom bloody, and seldom offensive ; and the general health may be hale in all respects. The remedy is excision of the superior maxilla ; and this, though a severe and somewhat difficult operation, may be fearlessly undertaken, even in the most advanced cases of this disease—if genuine ; experience having proved that the issue of such operations is almost invariably prosperous.

The osteocephaloma may be of original formation, or may

be the result of osteosarcoma degenerated. When of the former character, the diseased formation has extended beyond the limits of the superior maxilla, in which it originated, ere any considerable prominence has appeared externally. The outward tumour may be yet trifling, while the mouth and fauces are completely occupied, and the base of the cranium hopelessly involved. The system, too, is already worn by the malignant hectic. In such cases, we cannot—by excision of the superior maxilla, the palatine bones, and the malar—hope to take away the whole of the tumour; a portion remains, deep-seated and inaccessible; from this, reproduction of a tumour, soft, fungated, and bleeding, takes place—and a most disastrous issue is precipitated; or, not improbably, the already much enfeebled system speedily sinks under the immediate effects of the operation. In short, while we may perform excision of the upper jaw, with the best prospect of success, late, in osteosarcoma; we ought to refrain from operation in all examples of osteocephaloma, excepting those in which we are satisfied that the disease is yet recent, and limited to the bone in which it began.

Extirpation of the Superior Maxilla.

The patient is seated firmly on a chair, or reclines on a table with the head and shoulders considerably elevated; for so the manipulations of the surgeon are facilitated, and the outward escape of blood is favoured. The jaw having been made clear of teeth at the point where section is intended to be made, a strong bistoury is inserted near the inner corner of the eye, over the nasal process of the superior maxilla, and is brought down to the mouth; cutting the lip in the mesial line, and dissecting the ala of the nose from its basis. The knife is again entered over the external angular process of the frontal bone, and carried obliquely downwards to the angle of the mouth; dividing the whole thickness of soft parts. The flap, indicated by these two incisions, is then dissected upwards from off the tumour; and is held raised by an assistant. The orbital contents are separated from the bone, on their lower aspect; and are gently elevated and protected by a flat copper spatula introduced, which is also

retained by the assistant. The soft palate is incised in the mesial line, correspondingly with the wound of the lip ; and, by cross cutting, the pendulous velum of the palate is separated from the doomed parts—now isolated, so far as the soft textures are concerned. By a small saw—stronger, longer, and of rather less depth than what is ordinarily sold as Hey's—the union between the maxilla and malar bone is severed. By the same instrument, the alveolar process is cut through, at the part exposed by the labial wound ; and a groove is also made in the palatine process, at the part incised. A pair of stout and long bone-pliers are then used to complete the section at this part ; one blade resting in the palatine and alveolar groove, the other passed into the corresponding nostril. If such an instrument be not at hand, however, the section may be completed readily enough by means of the saw. The nasal process is severed by the ordinary cutting pliers. And, now, by pressing the tumour downwards it is dislodged from its connexions ; while complete separation is readily effected by touching with the knife those soft parts which require its edge. The velum of the palate, formerly separated, is carefully preserved—and, if possible, also the palatine plate of the palate bone. One or two vessels, hanging in the deep wound, will probably require ligature ; and the facial vessels, which during the operation were restrained by the fingers of an assistant, are also secured. The amount of deep bleeding is often but slight ; the vessels being torn, not cut, during the evulsion of the tumour. The vacant space is cleared of coagulum, and filled with lint ; and over this the flap is replaced. Both facial incisions are then brought together with great accuracy, partly by means of the twisted form of suture, partly with the interrupted ; the treatment is conducted for adhesion ; and, generally, this does not fail to occur, in almost the entire extent of the facial wound. The deep cavity of course inflames and suppurates. The lint loosens, and is brought away. A less amount of dressing is daily renewed, medicated with a weak solution of the chlorides ; granulation advances, and cicatrization is in due time obtained. In some cases, a marked deficiency remains ; and this may be remedied by the skill of the dentist. But in other cases, the de-

ficiency is wonderfully atoned for, by Nature's effort alone ; partly by the formation of new matter, partly by contraction and accommodation of the old.

When the tumour is of large size, the malar bone is encroached upon, and has to be taken away along with the maxilla. In such a case, a third incision is made, along the zygoma, terminating in the upper part of that which passes from the outer corner of the eye to the angle of the mouth ; and the zygoma is divided by the bone-pliers.

If the tumour be small, one incision may suffice—that from the outer corner of the eye to the angle of the mouth ; it being quite possible to expose the parts sufficiently, by raising the triangular flap, retaining the lip and front-face entire.

If any doubt should occur to the surgeon, as to the swelling being dependent on a solid growth, an exploratory puncture should be made in the direction of the antrum, previous to operation. For, excision of the upper jaw is rather too severe a remedy in the case of mere distension of the antrum by accumulation of fluid.

CHAPTER VIII.

AFFECTIONS OF THE FACE.

Wounds.

WOUNDS of the face are apt to bleed freely, and usually require deligation of the vessels. Coaptation should be most carefully effected, and adhesion courted, in order that deformity by cicatrization may be avoided, as much as possible. Transverse wounds may interfere unpleasantly with the parotid duct ; and, by division of the branches of the portio dura, may paralyze the cheek, at least for a time. After cicatrization, resumption of the nervous function may be expedited by friction.

Warts.

Warts not unfrequently form on the integument of the face. They should not be allowed to remain: for, by the time old age has supervened, they will be found either already degenerated, or prone to become so. It is well to remove them early, by the ordinary means—(*Principles*, p. 576)—while they are yet simple.

Erysipelas.

Erysipelas seldom assumes the phlegmonous form in the face—the textures of which are fortunately but little fibrous. Punctures, consequently, suffice for abstraction of blood, and relief of tension. They may be made freely; for the cicatrices leave no unseemly traces. After disappearance of the main attack, the patient must be carefully watched for some days; re-accession, with secondary abscess, being very apt to occur in the cellular tissue of the lower eyelids. As in erysipelas of the scalp, cold, and other repellent applications, should never be employed.

Spasm.

Spasmodic twitching of the muscles on one side of the face—the orbicularis oculi, the levators and retractors of the upper lip, and the corresponding movers of the nose—is an unpleasant affection of no very uncommon occurrence. Often it will yield to general treatment; more especially to rectification of the primæ viæ. Sometimes, also, patient counter-irritation is of use, directly over the part; and probably the preferable mode of applying this, is by rubbing on the nitrate of silver in substance, so as to vesicate. In chronic and obstinate cases, tenotomy has been had recourse to.* In one case, a permanent cure followed subcutaneous division of the zygomatici, the levator anguli oris, a portion of the orbicularis oculi, and the depressor alæ nasi. In order to restrain hæ-

* DIEFFENBACH on *Division of Tendons and Muscles*, Berlin, 1841, p. 315.

morrhage, and consequent ecchymosis, likely to result from such a cross wound of the face, accurate pressure is necessary immediately after withdrawal of the knife.

Neuralgia.

Neuralgia affecting the branches of the fifth pair of nerves is termed *Tic Douloureux*; at once, unfortunately, one of the most distressing and most unmanageable affections to which the human frame is liable. The treatment is supposed to fall within the peculiar province of the physician; and consists in carrying out the general principles on which the management of neuralgia is ordinarily conducted, (*Principles*, p. 525.) At one time, the aid of the surgeon was not unfrequently called upon; division of the trunk of the affected nerve, being supposed likely to afford at least an alleviation of the distressing symptoms. Experience has proved, however, that such an operation is in most cases inexpedient; the relief, if any, is but partial and temporary; and the neuromatous enlargements, which form on the truncated extremities of the nerve, are likely to produce ultimate aggravation. The operation, in truth, may be the means of converting an example of neuralgia, unconnected with structural change in any part of the nerve, into a worse form, dependent on structural change, which is not only considerable but probably irremediable.

Tumours of the Cheek.

Tumours form in front of the ear, and are of various kinds. They may be simple, fatty, fibrous, or cystic. Calcareous formations are not unfrequent; the earthy matter being deposited in the stroma of a chronically enlarged lymphatic gland. In removing such growths by the knife, the greatest caution should guide the movements of the hand; lest the branches of the *portio dura* be cut across, and paralysis of the cheek ensue; and lest, by division of the parotid duct, salivary fistula should be established. In order to meet such indications, the dissection should be proceeded with in the direction of the endangered parts—horizontally; contraven-

ing the general rule of cutting in the direction of subjacent muscular fibre.

Tumours of the parotid are rare, fortunately. For this gland is so situated as to render extirpation of it, entire, even in the healthy state, an operation of extreme difficulty. If it be the site of a simple tumour, of no great size or duration, removal may be attempted; the dissection will be deep and difficult; and, after every care, a portion of the morbid structure is likely to be left behind; but it is quite possible that reproduction may not occur. Malignant formations, however, are uniformly let alone; for, in their case, reproduction is certain, if any portion of the original growth, however slight, be permitted to remain.

Tumours over the parotid are comparatively frequent. They displace the subjacent gland, cause it to shrink by absorption, and come to occupy its place. Their extirpation can be effected both readily and safely.

Sinus of the Cheek.

Patients very frequently present themselves under the following circumstances. They are adolescents, or recently adult; and are more frequently female than male. Many months previously, a phlegmon formed on the lower part of the cheek, over the body of the lower jaw; suppuration took place; copious discharge has continued ever since; and though many and various remedial means have been employed, cicatrization, or even marked amendment, has never been obtained. There is a weak sinuous ulcer, with a pouting external surface; and the surrounding integuments are swollen and discoloured by passive congestion. In the great majority of such cases, if not in all, the exciting and retaining cause is to be found within the mouth. Opposite, or nearly opposite the affection of the cheek, a decayed tooth or stump will be found, probably imbedded in a very diseased gum. And on removal of this—and not until then—will the sinus and ulcer be brought to heal. Without extraction of the offending tooth or teeth, the most energetic and sustained practice may be put in force against the cheek, without success. After ex-

traction, healing may occur without any remedial means having been applied directly to the part.

Salivary Fistula.

In consequence of wound or ulcer, the duct of the parotid gland may open externally on the cheek. And by the outward discharge through the fistulous aperture, not only are deformity and inconvenience occasioned, but also a serious loss is sustained, of secretion very valuable in the processes of mastication and digestion. The principles on which a cure is to be attempted, are very simple; the establishment of an internal opening, by which the saliva may be poured into the mouth and saved; and the shutting up of the external aperture whence this fluid has previously run to waste. A puncture is made through the mucous membrane, communicating with the duct's cavity; and the permanency of this new passage is secured, by the lodgement of a suitable foreign substance—either left there for some days, or introduced at frequent intervals. The external aperture, having been made raw in its edges, is shut by means of a point of twisted suture. Adhesion may take place; if not, subsequent contraction is induced by the application of a heated wire, at long intervals. The sore produced by a burn heals, mainly, by contraction of the old textures; and this circumstance, so inconvenient in accidental forms of this injury, is here gladly taken advantage of, and turned to good account. But, of course, a re-application of the cautery is not thought of, until the cicatrizing result of its first employment has begun to cease. Otherwise, by maintaining the first, or ulcerative effect of the remedy, we should but amplify the aperture which we seek to close. Autoplasty may be of use, in those cases in which there is much loss of substance, and in which the ordinary means of effecting closure have failed.

Fracture of the Malar Bone.

This accident is rare. The deformity is considerable, and unfortunately not easily remedied. I lately met with a very marked example of it. A lad, aged 18, was struck on the

face by a full blow from the fist of a heavy athletic man. The zygoma had given way, and also the union between the malar bone and superior maxilla. The former bone had been driven much down, giving a very strikingly sunk appearance to the face, with marked deficiency of orbital margin. By examination from the mouth, it was also very apparent that the roof of the maxillary antrum had been broken and depressed. In addition to the deformity, the patient complained of much pain ; there was also a numbness of that side of the mouth ; and considerable difficulty was found in attempting to close the jaw, the redundant soft parts of the cheek lodging between the teeth. By pushing upwards with the finger-points, insinuated from behind, the malposition of parts was in some degree rectified ; but still considerable displacement and deformity remained.

CHAPTER IX.

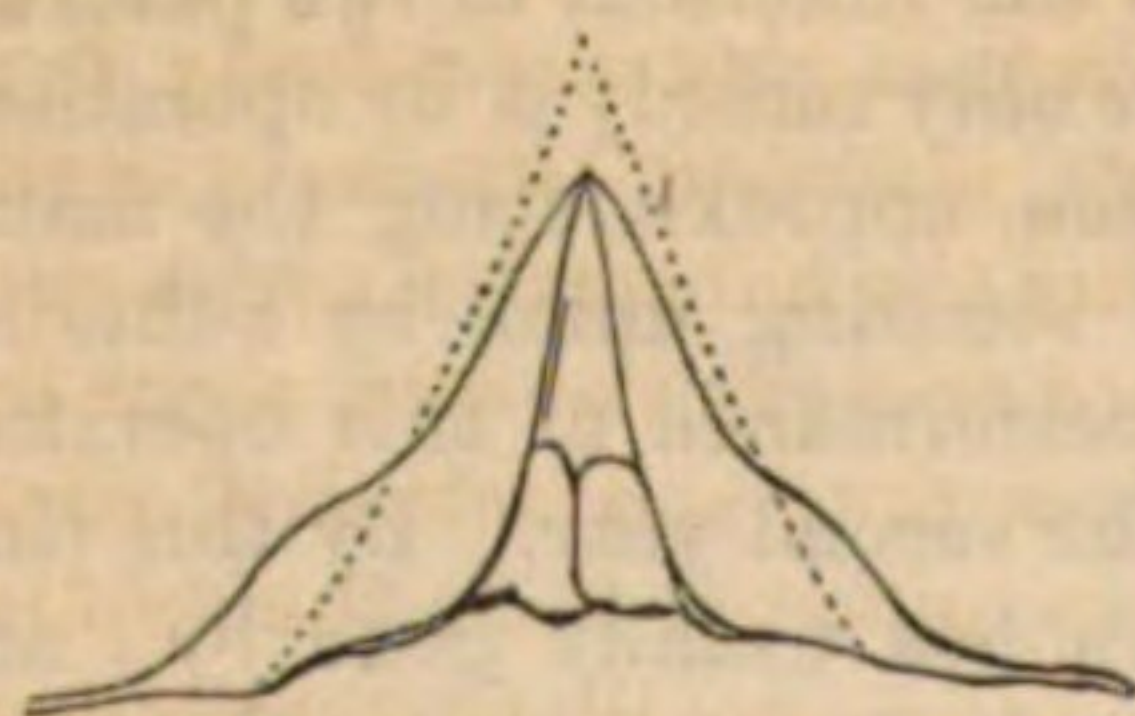
AFFECTIONS OF THE LIPS.

Harelip.

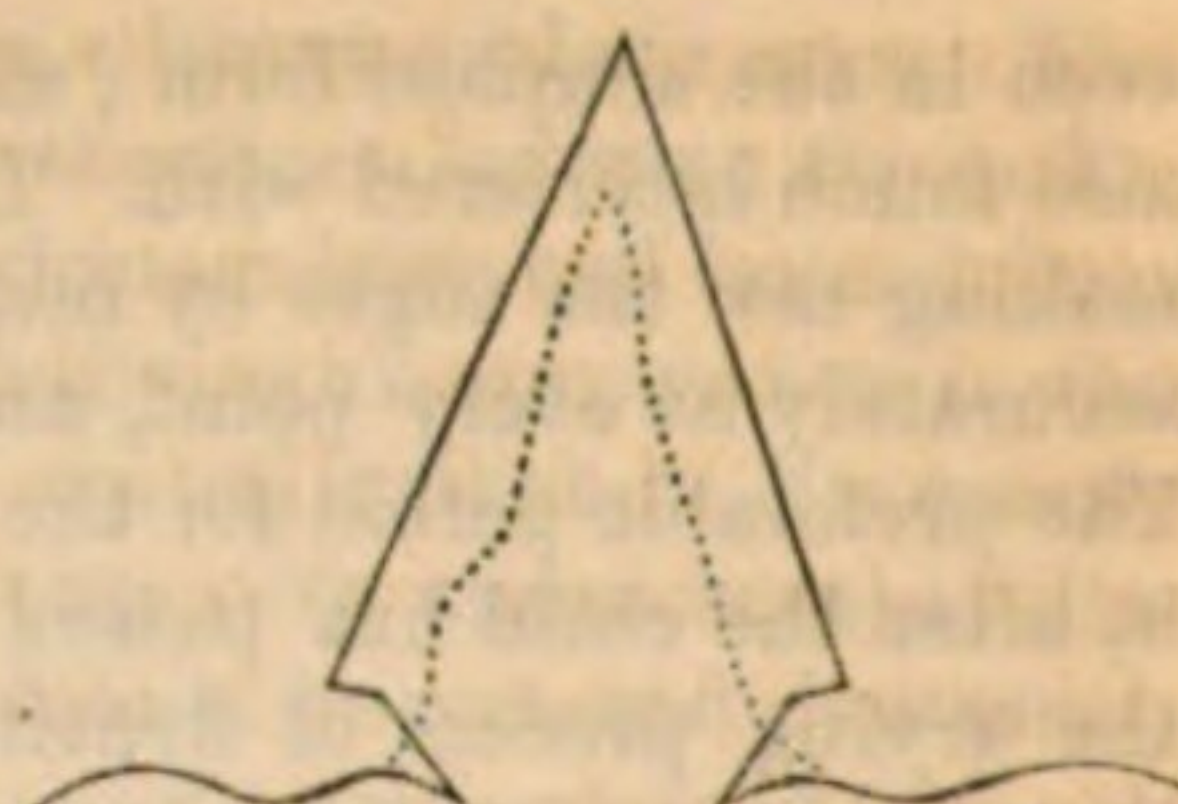
THIS term is applied to congenital deficiency of the lip ; the part, so deformed, being supposed to have a resemblance to the natural development of the lower animal. In general, there is a strong wish, on the part of the parents and friends, to trace the untoward result at birth to some sinister impression made on the mind of the mother during uterogestation—with what success it were more curious than instructive to inquire. The affection may be single or double, simple or complicated.

Single Harelip consists of a fissure, extending through the whole thickness of the lip, usually situate on one side of the mesial line, and either partially dividing the lip, or extending completely into the cavity of the nostril. When the affection is both simple and single, there is no other deformity in the mouth ; the hard and soft palates are entire and fully developed, and the gums are normal. Deformity is great

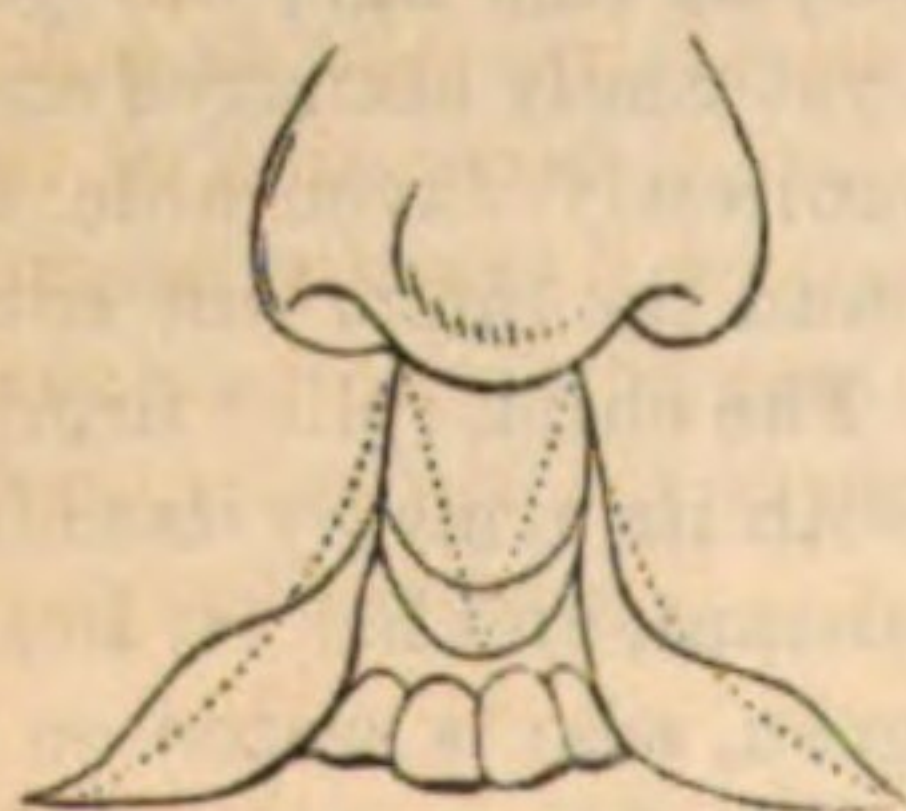
even in the simplest form ; and the functions of the parts are also much interfered with. The only remedy is by operation ; making raw the edges by incision, approximating the fissure accurately at every point, and securing union by adhesion. The preferable period for the performance of this operation is, after the child has passed the second year. By this time the trying process of dentition has usually gone by ; and there is consequently a better tolerance of pain and loss of blood than at an earlier period. Also, at this age, the patient, though unruly to its utmost, is yet easily managed and controlled ; and the procedure is manifestly favourable to the due advancement of articulation, and the important educational results which follow thereon. The child, rolled firmly up in a linen sheet—mummy-wise—with its arms by its side, is held on the lap of a nurse or an assistant, and has its head secured between the knees of the surgeon, who is seated on a chair, in front of the patient and nurse. The free margin of the lip, on one side of the fissure, is taken hold of by the finger and thumb, and put on the stretch. A narrow and straight sharp-pointed bistoury is then inserted at the upper or nasal angle of the deficiency, and carried steadily downwards, after transfixion, so as to leave a smooth cut surface on the fissure's margin. The like is done on the opposite side. But in neither case is the section made complete. Near the prolabium the knife is arrested and withdrawn, and the two flaps are left pendent. The lip is temporarily brought together, and an estimate is made of how much of the lower part of these flaps should be retained, in order to fill up completely the notch which is otherwise so apt to remain at the prolabium ; and, this having been ascertained, the necessary abbreviation of the pendent flaps is made by knife or scissors. The wound is then finally closed, accurately, by points of twisted suture, in the same way as in the operation for restoring the columna nasi, (p. 173.) For this modification of the operation, in order to obviate the prolabial notch, we are indebted to M. Malgaigne. If a pouting redundancy should be found, after cicatrization, it may easily be reduced to the proper outline, by knife or scissors if need be ; but, in general, absorption will render all secondary interference unnecessary.



The ordinary operation.



Malgaigne's operation.



In *double harelip*, there is a fissure extending from each nostril, and usually complete. The intermediate portion of lip may be fully developed, or it may be short and deficient. In the one case, two lines of wound are necessary—the ordinary operation being applied to each fissure; in the other, a single approximation will suffice—as is sufficiently illustrated in the diagram.

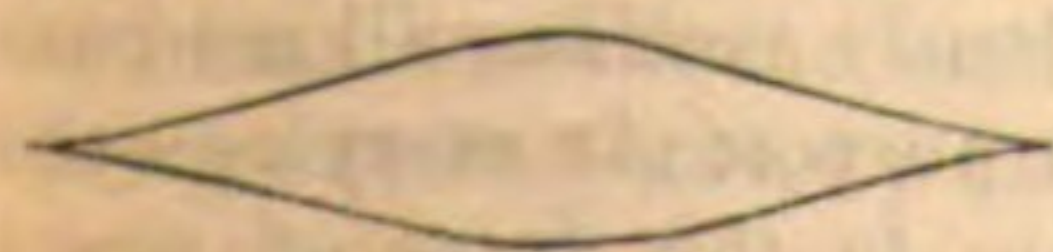
Complicated Harelip.—The double form is more frequently complicated than the single. The hard and soft palates may be cleft. Or the gum is in an anormal state; projecting forwards, between the fissures, sometimes adherent to the apex of the nose, and presenting teeth growing viciously. The anormal state of the palate makes no difference in the operation on the lip; except to expedite its performance, in the hope that the traction so exerted may have some good effect, in favouring diminution of the palatine chasm during progressive development of the parts. In the case of projecting gum, it is usually expedient to begin the operation by removing the faulty part, on a level with the normal gum, by means of bone-pliers; and then to complete the procedure in the ordinary way. In some few cases, repression of the prominence may be effected, by adaptation of a springed instrument, calculated to exert the necessary amount of pressure.

Ulcers of the Lips.

The lips are liable to ulceration of the ordinary kind; induced by exposure to weather, irritation of tartar or decayed teeth, external injury, or direct application of an irritant cause. The prolabium is the part most frequently involved.

The treatment is begun by removal of the cause, when that is apparent ; avoiding atmospheric exposure, subduing overaction caused by external injury, removing sources of irritation from the gums, discontinuing the habitual use of a short pipe, &c. Then applications are made to the sore, according as its appearance may seem to require ; and nitrate of silver, either in substance or in solution, is found to be the application most generally useful—the ulcer usually partaking more or less of the irritable characters. Throughout the treatment, it is of great importance to secure rest of the part as much as possible. In the child of strumous habit, ulceration of the prolabium and lining of the upper lip, near its centre, is very apt to occur, with much swelling of the part ; and in such cases the binding of a riband tightly over the lip is found to be very beneficial—both securing comparative rest of the part, and promoting discussion of the swelling by absorption.

Malignant Ulcers of the lips are unfortunately by no means rare ; but are peculiar to the advanced in years, as cancer usually is. The lower lip is much more frequently affected than the upper. The disease may commence by a carcinomatous formation of a warty character, or may exhibit at once the condition of cancer. (*Principles*, pp. 555, 576.) The most common inducing cause is the habit of smoking with a short clay pipe ; which becomes hot, and irritates the prolabium—daily, or many times a-day. The only remedy is by a free and early removal of the diseased part ; while the disease is yet limited, and no involvement of the lymphatics is apparent. For superficial, suspicious sores, affecting the mere prolabium, escharotics may suffice ; nitric acid, nitrate of mercury, chloride of zinc, or potassa fusa—freely applied. But when other textures are involved, the knife alone is worthy of confidence. When the affection is mainly on the surface of the lip, the whole may be taken away, and yet very little deformity may ensue. By two elliptical incisions, the diseased space is included ; the knife being entered in the middle of the prolabial space, and made to pass first on the integumental, and then on the mucous aspect of the disease.



The morbid structure, thus marked, is carefully dissected out ; and then the saved inte-

gument and mucous membrane are brought together by points of interrupted suture.

When the disease is more extensive, and the lip lax, it is yet possible both to remove the diseased part satisfactorily, and to prevent any great deformity. The including incisions are made in the form of the letter V, the apex pointing downwards; and with care taken that the good general rule is not transgressed, of taking away a border of apparently sound texture along with the truly carcinomatous formation. The wound is approximated and secured, by twisted suture; as for harelip.

In not a few cases, however, almost the whole surface of the lip is involved, the disease at the same time extending deeply towards the chin. Under such circumstances, we have but one paramount indication to fulfil, namely, the complete excision of the diseased part; and this is uncompromisingly effected by a free sweep of the knife. Approximation is not attempted. But the part is left to granulate, and heal, as ordinary suppurating wounds. Sometimes the ultimate deficiency of lip, after such an operation, proves much less than might have been anticipated; partly on account of formation of new matter, partly by resilience and centripetal movement of the old textures.

Cancrum Oris.

This is an example of Sloughing Phagedæna. (*Principles*, p. 245.) It originates in the mucous membrane on the lip or cheek, and extends sometimes both rapidly and far, presenting the usual characters of that class of sore. It is almost solely met with in the ill-fed, ill-clothed, and ill-housed children of the poor, in densely populated towns. But in any child of weakly habit, it may be induced, by imprudent mercurialism. The constitution sympathizes greatly; in the form of irritative fever, tending to the typhoid character. The treatment consists in amending the outward condition of the patient, if possible, by change of air, ventilation, &c.; in rectifying the primæ viæ, but studiously avoiding all mercurial medicines, for this or any other purpose; in carrying out the active local treatment suitable to this form of sore,

(*Principles*, p. 246) ; and in the internal administration of chlorate of potass—found to be a very appropriate alterative, in the dose of from one scruple to two scruples in the course of twelve hours. In the worst form, nourishment, tonics, and even stimuli may be imperiously demanded, to prevent sinking.

Wounds of the Lip.

These may be occasioned by sharp instruments ; or by contusions of the lip on sharp and unyielding teeth beneath. Hæmorrhage may be considerable. But the use of the ligature is seldom required ; the twisted suture sufficing both for hæmostatic purposes, and for approximation of the wound. And the latter indication should be fulfilled with much accuracy, in order to prevent deformity. If any foreign matter—as earth, sand, coal, stone, &c.—lodge by impaction in or near the wound, it should be carefully removed at the time of the first dressing ; otherwise trouble in subsequent removal, and deformity by discolouration, is likely to result—besides the risk of undue vascular action, and consequent tediousness of cure.

Cheiloplastics.

When the lip has been lost, either entirely, or in its greater part, in a patient otherwise in tolerable health, and not far advanced years, restoration by autoplasty may be very properly contemplated. The part may have been destroyed by wound, sloughing, or intractable ulceration. In the last mentioned case, we must be very careful not to attempt the engrafting of a substitute, until all ulcerative tendency has for some time wholly ceased—for very obvious reasons. After removal of truly cancerous disease, restorative interference is seldom expedient.

The operation is conducted on the same principles as in Rhinoplastics. A flap, of suitable form and dimensions, is brought from beneath the chin. A connecting slip is left at the symphysis ; there gentle twisting is made, so as to bring the integument to the surface ; the part is secured in its new site by suture ; and, by the like means, a portion of the sub-

mental wound is approximated—the rest being left to heal by granulation. After adhesion of the flap is completed, the mental slip of attachment is divided, and smoothed down, by the bistoury.

CHAPTER X.

AFFECTIONS OF THE PALATE.

Congenital Deficiency.

EXTENSIVE deficiency of the *hard palate* is with difficulty remediable. A mitigation of the deformity and inconvenience may be effected by the dentist; a metallic plate being fitted into the chasm, on completion of the part's development. Also, something may be done by surgery; as recommended by Dr. J. M. Warren. The soft parts, having been carefully dissected off the bony arch, are brought together by suture, after the edges of the gap have been made raw. What filled the arch will probably meet readily on a plane surface; but should difficulty be experienced, further relaxation may be obtained by dividing the anterior pillars of the soft velum.*

A mere fissure of the hard palate may disappear spontaneously, during the progressive development in adolescence. And if the mucous membrane should be slow in closing over, this process may be expedited by occasionally applying a heated wire, or by raising and approximating the raw edges.

The *soft palate* may be fissured, alone. Then, if the want of substance be not great, we have it in our power to attempt remedy by operation. Three circumstances, however, are essential, as preliminaries to the attempt. There must be no great deficiency, otherwise traction in approximation will be great, and adhesion will almost certainly fail. The patient must be of adult age, or nearly so; great steadiness and self-control being indispensable on his part, both during the ope-

* *New England Quarterly Journal of Medicine and Surgery*, April 1843.

ration and afterwards. And the patient must also be of sound system, and in good health ; so as to afford every possible facility to the occurrence of adhesion in the wound. And unless a concurrence of these circumstances can be obtained, the prudent surgeon will refrain from interference.

The operation is termed *Staphyloraphe*, or *Velosynthesis*. It should consist of three distinct parts ; preparation of the velum, paring of the edges, and approximation of the fissure by suture. The first part requires some considerable time for its completion. For weeks before the actual operation, the patient accustoms himself to open his mouth wide, and to retain it so, steadily and enduringly—with no effort at deglutition of saliva : and he also seeks to reduce the irritability of the parts, by frequently touching them with his finger, or otherwise. The nature of the operation is fully and candidly explained to him, and his willing co-operation ensured. Then he is seated before a strong light, with the mouth widely opened, and the edges of the fissure are made raw, by a narrow sharp-pointed bistoury, used as in harelip ; a volsella being employed to seize the uvular extremity, and so to make the part tense during incision. This completes the second part of the operation. Some hours are now allowed to intervene ; and it is well to give some simple nourishment at this time—it being obviously important to avoid the effort and movement of deglutition for some time after approximation has been effected.

The third part of the procedure consists in bringing the wound into accurate apposition at every point ; in diminishing the strain on the sutures, by lateral and parallel incision of the mucous membrane ; and in keeping the part in a state of as complete quietude as circumstances will possibly allow. The reason why approximation is not made immediately after incision, is, that it is expedient to allow all oozing of blood to cease in the first instance ; so as to avoid the irritation, and involuntary movements of the palate, which its trickling does not fail to produce. But bleeding having wholly ceased, there is no necessity for further delay. The necessary number of sutures are passed ; and are secured either by the ordinary knot, or by passing the oral ends through a soft metallic bead, running this up to the line of wound, and clasping it on the

threads there by means of firmly pointed forceps. Not a few instruments have been contrived for facilitating the sewing department in this operation—undoubtedly one of great difficulty ; but it is probable that the curved needle in a fixed handle—as used for deligation of vascular tumours—will be found quite suitable in experienced hands ; or, a short needle, very much curved, may be conveniently enough passed by means of a *port-aiguille*. If the patient be steady and resolute, all the ligatures may be passed at once. If not, it may be well to let some little time intervene between partial and complete approximation.

When approximation has been completed, a longitudinal incision is made on either side of the palate, through the anterior mucous membrane ; so as, by permitting expansion at the cut part, to diminish traction on the line of union. Absolute starvation is not desirable. But simple farinaceous food is sparingly and carefully administered from time to time ; the patient being as passive an agent as possible in the act of taking in the ingesta. And the ordinary constitutional treatment, favourable to the occurrence of adhesion, is of course rigidly enforced. Not a little self-denial is necessary, on the part of the patient, to avoid the oft-occurring excitements to coughing, hawking, and swallowing ; compliance with which would have a manifestly unfavourable effect upon the wound.

Mr. Fergusson has lately proposed a very ingenious modification of the ordinary operation ; obtaining steadiness and quietude of the parts operated on, by means of myotomy. Looking on a split palate, from the mouth, the parts are seen hanging quiet in the fauces, with a distinct central gap in the velum. If the flaps be touched, they will be raised upwards, by the action of the *levator palati* muscles. If a stronger stimulus be applied—as by the rude touch of a finger—“ each flap is forcibly drawn upwards and outwards, and can scarcely be distinguished from the rest of the parts forming the sides of the nostrils and throat ;” and this is done by the action of the *palato-pharyngei* muscles, added to that of the *levator palati*. On exciting the parts situated more posteriorly, “ as in the second act of deglutition, the margins of the fissure are forced together, by the action of the superior constrictor mus-

cle of the pharynx." The main opponents of approximation in staphyloraphe are thus shown to be, the levatores palati and palato-pharyngei. And Mr. Fergusson's operation is planned so as to divide and temporarily paralyze these muscles. "With a knife, whose blade is somewhat like the point of a lancet, the cutting edge being about a quarter of an inch in extent, and the flat surface being bent semicircularly, an incision is made about half an inch long, on each side of the posterior nares, a little above and parallel with the palatine flaps, and across a line straight downwards from the lower opening of the Eustachian tube. By this incision—placed about midway between the hard palate and the posterior margin of the soft flap, just above the thickest and most prominent part of the margin of the cleft—the levator palati muscle on each side is divided, just above its attachment to the palate. Next, the edges of the fissure are pared with a straight blunt-pointed bistoury, removing little more than the mucous membrane. Then, with a pair of long blunt-pointed curved scissors, the posterior pillar of the fauces is divided, immediately behind the tonsil; and, if it seems necessary, the anterior pillar is cut across too; the wound in each part being about a quarter of an inch in extent. Lastly, the stitches are introduced. . . . Or, it may be found more convenient to divide the palato-pharyngeus first, next the levator palati, and then to pare the edges when the muscular action has been taken off." * When the pared edges look thin, it may be well to increase their breadth by applying the curved knife so as to split the margins to a slight depth; so rendering the occurrence of satisfactory union more probable. Occasional swallowing is not likely to disturb the approximation; the action of the superior constrictor having rather an opposite tendency.

Ulcer and Exfoliation of the Palate.

The lining membrane of both the hard and the soft palate is liable to ulceration, from ordinary or specific causes. The most intractable, and not least frequent examples, are those

* *Med. Chir. Transact.*, vol. xxviii., p. 291.

which are connected with the mercurio-syphilitic taint of system. In such, constitutional treatment is all-important ; the local applications varying, according to the characters of the sore.

Exfoliation of the hard palate, not unfrequently complicated with caries, and necessarily accompanied with ulceration of the corresponding mucous membrane, is seldom if ever found to occur, except when mercury has been freely administered. Again, treatment is mainly constitutional. Locally, separation is patiently awaited ; and, when completed, removal of the sequestrum is duly effected, if necessary. If the whole thickness of bone have perished, an aperture of communication necessarily results, between the nasal and oral cavities. If this be large, the deficiency can be supplied only by mechanical contrivance. If, however, it resemble a merely fistulous opening, closure of the mucous membrane may be obtained, by the occasional application of a heated wire.

CHAPTER XI.

AFFECTIONS OF THE TEETH.

It is unnecessary here to enter fully on the various and important topics connected with the subject of this chapter. A few leading surgical points may be stated ; reference being made, on other matters, to the various separate works which treat of Dentistry in detail.

First, it is well that the student remember, how affections of the teeth are not connected only with the convenience, comfort, and good looks of a patient—but with his health and very existence. The causes—sometimes remote, sometimes tolerably direct—of many affections implicating the general frame, as well as important parts of it, proceed entirely from the contents of the alveoli. Bad teeth “are frequently the cause—and the sole cause—of violent and continued head-ach ; of glandular swellings in the neck, terminating in, or combined with abscess ; of inflammation and enlargement of the tonsils, either chronic or acute ; of ulcerations of the

tongue or lips, often assuming a malignant action from continued irritation ; of painful feelings in the face, tic douloureux, pains in the tongue, jaws, &c. ;” of abscess and sinus of the cheek ; of enlargement and change of structure in the gum, which may lead to dangerous tumour of the bone ; “ of disordered stomach, from affection of the nerves, or from imperfect mastication ; and of continued constitutional irritation, which may give rise to serious constitutional disease.”

Crowded Teeth

Are important in a surgical point of view. Behind, the irritation so caused may induce swelling, vascularity, and ulceration of the mucous membrane ; probably with repeated attacks of troublesome and even dangerous cynanche. In front, crowded incisors are very apt to induce abscess ; not confined to the soft parts, but implicating the bone also. The remedy is plain ; early to prevent mischief, by removal of one or more of the redundant organs ; and, at a later period, to promote retrievance of disaster, by the same procedure—removal of the cause.

Caries of the Teeth

Is the term usually employed to denote decay of the osseous matter ; which usually commences on the surface, at one or more points, beneath the enamel, and proceeds inwardly until the pulp is exposed—the enamel also giving way at an early period. When the disease is yet recent and limited, its progress may be arrested ; by clearing away the disorganized substance, and “ *stopping*” the cavity, either with gold or with cement. But after the pulp has been fairly exposed, and pain established, it may be stated as a general rule—not to be rashly or often deviated from—that under such circumstances “ *stopping*” is not advisable, and extraction of the offending part is highly expedient. Long to retain a decayed tooth, or portion of a tooth, in the hope of by various means quelling the pain of toothach, and so avoiding the pain of extraction, is just to court the accession of some of the more important evils already enumerated, as likely to spring from such a source of irritation.

Toothach,

It is important to remember, may proceed from several causes ; and so requires different treatment in different cases. It may be an example of neuralgia, with or without any connexion with diseased teeth or gums ; requiring the ordinary anti-neuralgic treatment, local and general. It may be caused by caries of the tooth, advanced so as to expose the pulp ; and then may be palliated by anodynes ; temporarily arrested, painfully, by escharotics ; or entirely quenched by extraction of the tooth ; and the last, as already stated, is in most cases, the preferable proceeding. It may proceed from inflammatory action, in or around the tooth—in the interior of the tooth's cavity, or in the alveolar investing parts—not necessarily connected with decay of the tooth at any part ; and this form is plainly to be assuaged by antiphlogistics, local and general ; locally, leeches and fomentation to the gum ; constitutionally, purgatives, antimony, and low diet. Also, severe pain may be felt in the teeth, apparently sound, quite of a rheumatic origin and character ; and this is to be got rid of by anti-rheumatic remedies, mainly constitutional in their operation. Change of structure in the fang of the tooth—it becoming coated by rough osseous deposit—may induce intense pain, though the organ be in other respects sound ; by such hypertrophy, it is probable, the nerves are incommoded and compressed ; and the only remedy is by extraction. And, lastly, the fang, or fangs, of a tooth may become necrosed, the crown and cervix remaining apparently sound ; chronic abscess forms around the affected part, the matter accumulating in a distinct membranous pouch ; and much pain is likely to be thus occasioned, until either the tooth is extracted, or it becomes loose, and permits a spontaneous evacuation and discharge.

Extraction of Teeth.

Extraction of a tooth is demanded, not unfrequently, of the surgeon ; as an operation of itself ; as a means towards the cure of another, and perhaps distant affection ; or as a part of a more serious operative procedure—as in extirpation of a

portion of a jaw. Forceps, and the tooth-key, are the instruments usually employed. The former, in general estimation, is by much the preferable; equally certain to effect the object in view; and possessing the great recommendation of exerting all the force on the doomed part, and leaving the alveolus and gum comparatively, or absolutely, uninjured. Practice is, no doubt, essential to the skilful and efficient use of forceps; and many instruments are required in the well-equipped armamentarium, each adapted to the configuration and lodgment of the tooth to be removed. On this subject, the student can be referred to no better source of information than to the practical, safe, and intelligent manual of Mr. Chitty Clendon.

Stumps are removed, either by means of sharp forceps, introduced beneath the gum; or by a lever passed between the offending part and its alveolus, making use of a neighbouring sound tooth, if possible, as a fulcrum.

Hæmorrhage after Extraction.

Troublesome bleeding may follow the ordinary extraction of a tooth, and may proceed from one of two causes. An arterial branch, of some size and activity, may have been implicated in the injury inflicted on the alveolus. Or the patient may be one of those unfortunates afflicted with the hæmorrhagic diathesis. The former case is usually manageable enough. The cavity is sponged dry, and an escharotic applied—nitrate of silver, probably the preferable—so as temporarily to arrest the flow, and afford a dry bed for the compress. And then, with all convenient speed, strips of lint are inserted firmly into the cavity, by means of a stout probe or director; and the jaws, having been brought together with a compress interposed at the injured part, are made to exert and maintain a sufficiency of pressure on the bleeding point. In the other case, the same local treatment is advisable, with the other means suitable to the hæmorrhagic diathesis. (*Principles*, p. 513.)

Tartar on the Teeth.

Accumulation of salivary deposit is to be prevented, for obvious reasons; its presence being prejudicial to the teeth themselves, to the gums, to the mucous membrane of the cheek and lips, and to the tongue. The teeth are apt to loosen and decay, the gums to become congested, the mucous membrane to become the seat of obstinate and painful ulceration. In effecting removal, care must be taken to leave the enamel uninjured.

Recession of the Gums.

In advanced years, the gums recede from the cervices of the teeth, especially in front, exposing the fangs; occasioning looseness, pain, irritation, and final decadence—though in other respects the organs may be quite entire. In such cases, but little can be done by remedial treatment; the occurrence is only a part of the general decay, and is in all respects to be regarded as such. A similar result may follow the accumulation of tartar; it is to be averted by removal of the offending matter. Congestion of the gums may induce it; and this cause is met by local abstraction of blood—by leeches or scarification—and by the subsequent use of astringent dentifrices; at the same time it is very necessary to look to the state of the primæ viæ, and to correct the irregularities which will probably be found there.

CHAPTER XII.

AFFECTIONS OF THE JAWS.

Parulis.

THE term *Parulis* denotes the condition of *Gumboil*; an inflammation of the gum, usually connected with a decayed tooth or portion of a tooth. The crescent swelling causes much pain and discomfort, sometimes with smart constitu-

tional disturbance. On suppuration taking place, relief is obtained by evacuation of the matter ; but so long as the decayed tooth remains, a certain discharge, with swelling and pain, continues to prove the source of no slight annoyance. The treatment varies according to the stage of advancement. At first, the affection just originating, the decayed tooth should be removed at once, and bleeding from the wound encouraged ; and afterwards, if need be, blood is further withdrawn by leeching the affected part—the animals being most conveniently applied through a glass tube. When matter has formed, it should be early and fully evacuated ; and after the excitement following incision has abated, under the ordinary antiphlogistic means, the offending tooth or stump should be gently extracted. To perform extraction earlier, might be to aggravate the inflammatory action unnecessarily. When the matter has formed and been discharged, extraction of the tooth will ordinarily suffice, for effecting contraction and closure of the discharging aperture, with subsidence of the swelling and pain. If not, some of the many suitable astringent solutions may be applied to the part.

Epulis.

Epulis denotes a solid tumour of the gum, of non-inflammatory origin ; but, like parulis, often, if not usually, connected with the presence of a decayed tooth, or portion of alveolus. It may be either simple or malignant. The simple form is a sarcomatous growth, at first seated in the soft parts of the gum, but tending soon to involve the subjacent bone ; in short, the tumour, at what may be termed its period of maturity, may be truly considered an example of osteosarcoma, on a small scale. It spreads slowly. Teeth loosen, and are surrounded in the fleshy growth ; and the body of the bone becomes more and more involved. In the early condition, it is sufficient to remove the offending tooth, or piece of bone ; and, with a bistoury, to excise the altered portion of gum ; repressing subsequent tendency to growth, if need be, by the application of an escharotic. When the bone has become involved, it is essential that the affected portion shall be taken

away—early, and freely—for obvious reasons ; and this is readily effected by knife, saw, and cutting pliers.

The malignant form is, fortunately, by much the more rare in occurrence. Very early the bone is affected ; and the tumour is a true specimen of osteocephaloma. Soon, the surface ulcerates and fungates, with bloody loathsome discharge, and the spread is rapid in all directions. Obviously, the only remedy is by ablation ; and that only at a comparatively early period. (*Principles*, p. 590.)

Sometimes, malignant disease commences in the upper jaw, not with the formation of tumour, but at once by ulceration. The loss of substance speedily wastes the alveoli, and, opening into the antrum, discloses a foul and hideous sore—at a very early period beyond the reach of the most active surgery.

Tumours of the Lower Jaw.

The lower jaw, like the upper, is liable to be the seat of a chronic collection of fluid—here usually termed *Spina ventosa*—as well as to be occupied by both osteosarcoma and osteocephaloma.

Spina ventosa of the lower jaw, is, as formerly explained, (*Principles*, p. 592,) an example of *osteocystoma*. The remedy is by puncture and evacuation ; gradual contraction and consolidation of the cavity being sought for, by pressure from without, and by maintaining a certain amount of vascular action within—as by the suitable employment of a seton, or stimulant injections.

The solid tumours require the same treatment, as in the upper jaw. But, with this difference, that, in consequence of the relative anatomy of the parts, complete ablation of an osteocephaloma is within our power at a much more advanced period, than in the case of the superior maxilla ; inasmuch as the whole diseased structure can be included in the incisions, and taken away.

The simple *Osteoma* (*Principles*, p. 584) has occurred in the lower jaw ; at first, to be treated by attempts at arrest of growth, and subsequent discussion ; this failing, ablation of

the affected part is to be had recourse to, for even this simple structure has been known to degenerate.

Extirpation of the Lower Jaw.

Amputation of the whole bone has been practised, on account of tumour ; but with such a result as scarcely to warrant repetition of the operation. The dangers to life are many and almost insuperable. Besides the dangers by loss of blood, and constitutional shock by the severity of procedure, there is an immediate risk of suffocation by the uncontrolled condition of the tongue and fauces. Inflammatory action, causing œdema, is, at a more advanced period, certain to afford laryngeal obstruction, threatening asphyxia. And, supposing these dangers past, another remains, by bronchitic or pneumonic seizure, cold air being at once and constantly admitted to the larynx ; whereas, for a long time previously, atmospheric accession had been by a most circuitous and gradual route, in consequence of the presence of the large obstructing tumour.

Partial removal of the lower jaw, is a very feasible operation ; and, as formerly stated, when undertaken on account of genuine osteosarcoma, is seldom followed but by a fortunate issue.

Not unfrequently the jaw is so occupied by tumour, as to render removal of the entire half necessary ; by disarticulation, and division at or near the symphysis. An incision is begun opposite the articulation, and continued downwards and forwards, along the posterior and inferior borders of the bone, first on its ramus and then on the body. Opposite to where it is intended to saw the bone in front, the forward course of the knife is arrested, and the instrument is directed upwards to divide the lip—leaving, however, the prolabial portion entire. The flap, thus indicated, is dissected upwards ; including all the soft parts, and fully exposing the tumour. Then the anterior portion of the bone, where section is to be made—wide of the tumour—is fully cleared of soft parts, on every aspect ; a tooth, if necessary, is extracted ; the external surface is notched by Hey's saw, and section is completed by stout cutting pliers. Now the internal attachments of the tumour and implicated bone are divided by the bistoury. And as the

articulation is approached, the anterior portion of the bone is depressed by the operator's left hand, so as to facilitate disarticulation ; yet avoiding such an amount of pressure as may occasion fracture of the altered structure. Depression being made by the surgeon, and an assistant now compressing the common carotid, the muscular attachments to the coronoid process are cut across, and afterwards disarticulation is effected ; this part of the operation being completed as rapidly as possible, and with the knife's point moving closely to the bone, so as to avoid an unnecessary loss of blood. The bleeding vessels are then secured at the upper angle of the wound, either singly, or by deligation of the common trunk of the temporal and internal maxillary arteries—which may happen to be exposed—by means of an aneurism needle. The facial, temporarily restrained by the fingers of an assistant, is last secured. And then the flap is replaced, and retained by suture ; the entireness of the prolabium in front obviously contributing much to the facility of accurate readjustment. The wound, in its major part, is likely to heal by adhesion ; a portion suppurates and gapes, not inopportunately, to permit suitable discharge of the purulent secretion from within. Dressing of the interior is conducted, as in the case of the upper jaw ; and consolidation, with reparation, in like manner results. During the process of cure, material benefit will accrue from the use of a mechanical contrivance, adapted to the teeth, whereby overlapping and displacement of the mutilated part is prevented. "Metallic caps are fitted to the teeth of the upper and lower jaws of the sound side, and are riveted and soldered together at their bases, so that, when applied, they shall have the effect of preventing the dragging of the remaining portion of the bone and chin, to the opposite side by the external pterygoid, mylohyoid, and digastric muscles, and by the elasticity of the soft parts. This apparatus should be worn for many weeks after the operation." * Contrivances may also be temporarily worn, on the injured side, to prevent undue shrinking of the cheek, during granulation.

A tumour, implicating the body of the bone only, on one side, may be removed by a similar but less extensive incision ;

* LISTON'S *Practical Surgery*, p. 318.

section of the bone being made at the angle and symphysis. But the propriety of such a proceeding is very questionable. Experience has shown that, in such cases, return of the disease is very apt to take place in the truncated ramus ; and when this happens, difficulty of disarticulation is found to be great, from want of power in depressing the coronoid process, and consequently in dividing the insertion of the temporal muscle. It is a more expedient operation, therefore, in all such cases, to anticipate return of the tumour, and the difficulties of a second operation, by at once performing disarticulation. Besides, it is a principle of operation quite analogous to what determines us to excision of a long bone, affected by tumour, rather than to saw it across ; preferring, for example, amputation at the shoulder joint, to an operation with section of the bone, on account of tumour of the humerus. (*Principles*, p. 588.)

Sometimes, though rarely, osteosarcoma originates in the ramus. Then it is necessary to effect disarticulation, after performing section at or near the angle of the bone. In such a case, it is expedient to grasp the ramus, after section, by means of a pair of firm and sharp-pointed forceps, so that the requisite lever-power may be obtained for depression. Also, it may be possible to effect this operation, without opening the cavity of the mouth.*

The symphysis may be removed on account of tumour ; a horizontal wound being made along the lower border of the bone, with a perpendicular incision at each extremity, leaving the prolabial surface entire. Section of the bone is made partly by the saw, partly by cutting pliers ; the requisite teeth having been previously extracted. After excision has been effected, some care of the tongue is necessary ; lest after division of its anterior attachments, it should be unduly retracted, and threaten asphyxia. To obviate this, the organ may be temporarily restrained either by ligature, or by a volsella.

Sometimes it is necessary to remove the symphysis, along with one half of the jaw ; the tumour being so extensive. This is effected by such a form of incision as recommended for disarticulation with section at the symphysis.

* *London and Edinburgh Medical Journal*, 1843, p. 964.

Sometimes it is expedient to remove a portion of the jaw, on account of ulcer or tumour of the soft parts which has implicated the osseous tissue secondarily. One paramount indication must in all cases be fulfilled : to remove the whole of the morbid structure, and to cut wide of the disease.

Caries and Necrosis of the Lower Jaw.

The lower jaw is liable, like other bones, to these common affections. But, in the present day, it suffers much less frequently and extensively in this way, than it did when mercurialization was more in vogue for venereal affections—real and suspected. Many teeth, large portions of the jaw, and even the greater part of the entire bone, not unfrequently were tediously and painfully discharged, as worm-eaten sequestra ; causing much disturbance, both local and general, at the time, and great subsequent deformity. When either of these affections do occur, the general principles of surgery are brought to bear on them ; by treatment partly local, partly directed to the system.

Fracture of the Lower Jaw.

The lower jaw may be broken by violence applied either directly or indirectly. Fracture near the middle of the body of the bone may be the result either of a blow delivered on the symphysis, or of injury directly sustained by the part fractured. The body of the bone is most frequently injured, but all parts are liable. The ramus has been fissured, the condyle has been broken off, the coronoid process has been snapt through, and the symphysis itself has given way. The fracture may be either simple or compound. Almost always, there is laceration of the mucous membrane, with consequent hæmorrhage into the mouth, and exposure of the fractured ends in that direction. The signs of the occurrence are sufficiently plain ; by deformity, crepitus, loss of power, and evident displacement. The mental portion is usually displaced downwards, by muscular action.

Reduction is easily effected ; and, usually, retention is not difficult. Supposing the fracture to be at its ordinary site,

near the middle of the body of the bone, the fragments are carefully adjusted, with the teeth in a line ; and two wedges of cork, sloping gently backwards, with their upper and under surfaces grooved for the reception of the upper and lower teeth, are inserted on each side of the mouth ; the jaws having been firmly closed on them, a paste board splint is adapted to the exterior surface ; and the whole is retained by suitable bandaging. The object of the wedges is twofold, and most obviously beneficial ; namely, to secure accurate apposition of the fragments, and to leave a vacant space in front, suitable for the passage of fluid nourishment without movement of the parts. The only stable objection to their use is, that, as foreign bodies, they may cause salivation or other inconvenience ; if this should happen, they can readily be removed ; and, meanwhile, by their temporary presence much benefit may have been already obtained. Sometimes, if firm teeth occupy the verge of each fractured portion, it may be well to secure these in apposition by silk ligature. Teeth quite detached should be removed at once ; and so ought fragments of bone, similarly circumstanced—in comminuted cases. For some time, the patient must be content with such articles of food as require no mastication ; and all movement of the fractured part must be avoided.

Dislocation of the Lower Jaw.

Dislocation of the jaw is forwards ; the condyles resting in front of the base of the zygomatic process. The accident may be complete or partial ; according as one or both condyles are displaced. And it may be the result of mere muscular action, as in yawning ; or of force applied to the symphysis, with the mouth more or less open. The mouth gapes, and cannot be shut ; the chin is depressed, and saliva trickles over it ; the condyloid space is vacant, and prominence is felt beneath the zygomatic process ; considerable pain is experienced, and articulation is very indistinct—perhaps altogether obstructed.

Reduction is effected by a triple and combined movement ; depression of the angle, elevation of the symphysis, and traction forwards of the whole bone. Thus the condyles are ex-

tricated from their entanglement, and, brought within the uncontrolled play of the muscles, are by them pulled back into their normal position. The thumbs, placed over the last grinders, within the mouth, effect the first movement; the rest of the hand makes the extension, with elevation of the symphysis. It is not necessary to protect the thumbs, by a towel or otherwise. As the jaw is felt to yield, the thumbs are made to slide on to the alveoli on the outer side; and the snap, which accompanies and denotes replacement, finds nothing interposed between the teeth. For some days, the motions of the jaw should be very limited; and in most cases it is well to restrain them by a bandage.

CHAPTER XIII.

AFFECTIONS OF THE TONGUE.

Glossitis.

THE inflammatory process in the tongue may be variously induced; by wounds, stings, or other injuries; by ptyalism; by acrid applications. Or it may occur spontaneously. The symptoms are—pain, swelling, salivation, intense thirst, impairment of the ordinary functions of the organ. In extreme cases, the swelling may occlude the fauces, and threaten asphyxia.

The treatment is by abstraction or counteraction of the cause; leeches to the part, or the opening of a ranine vein; and the ordinary antiphlogistics internally. In cases of urgency, we need not hesitate to make longitudinal incisions, freely, as if for phlegmonous erysipelas; the escape of blood is copious, the exuded fluids also find a ready exit, usually the swelling rapidly abates, and the wounds, which at first were gaping and deep, dwindle down to mere scarifications. The antiphlogistic result is satisfactory, and no important læsion of structure is inflicted on the part. Should a case present itself, too advanced to admit of waiting for the effects of incision, life must be saved at all hazards—by bronchotomy.

Wounds of the Tongue.

Wounds of the tongue bleed copiously. The hæmorrhage is to be commanded by ligature and styptics ; if need be, the cautery may be applied. In effecting approximation of the wound, after bleeding has ceased, it is plain that we can avail ourselves only of the common interrupted suture—other retentive means being inapplicable to the part. In the slighter cases of obstinate bleeding, the use of the sutures may effect not only approximation but also a hæmostatic result.

Ulcers of the Tongue.

Ulcers of the tongue, like those of the lips, may be either simple or malignant. The former may depend on local irritation, as from tartar or decayed teeth ; or on gastric irritation ; or on a general febrile condition ; or on a mercurio-syphilitic state of system. And the treatment, it is obvious, will vary accordingly. The preferable local applications are—nitrate of silver, either in substance or in solution ; and, in obstinate cases, the fluid pernitrate of mercury.

The malignant ulcers are to be got rid of, by knife, ligature, or cautery. The two first methods are usually to be preferred ; and due care must ever be taken, that the whole of the apparently diseased part, with a border of apparently sound texture, is removed.

Hypertrophy of the Tongue.

The tongue is occasionally the seat of simple enlargement. The normal texture of the organ is gradually expanded ; and the papillæ become greatly enlarged. Much inconvenience necessarily results ; even though, as usually happens, the jaw in some proportion accommodates itself to the altered interior. Ultimately the tongue protrudes ; and a wasting discharge of saliva necessarily results. Deglutition, articulation, and even breathing, are more or less interfered with.

The treatment is by rectification of the primæ viæ—usually very prominently disordered ; by repeated leeching of

the part ; and by the internal administration of the iodide of potassium. Should such means fail, it may be expedient to remove a portion at the apex, of a wedge shape, and of such a size as to restore the organ to something like its normal bulk, on approximation of the wound's edges ; at least rendering the organ capable of residence within the mouth, and so removing the principal deformity and inconvenience—protrusion.

Induration of the Tongue.

The tongue, instead of undergoing a general hypertrophy, may be affected by partial enlargement ; certain portions becoming elevated, hard, and painful—being the seat of a chronic inflammatory process of a low grade. The swellings may remain of an indolent nature, slowly enlarging, or altogether stationary. Or they may slowly suppurate ; the matter imperfectly discharging itself by a ragged and somewhat sinuous aperture ; the general appearance of the part closely simulating malignant disease.

The treatment is as for hypertrophy, by leeching, alteratives, and attention to the primæ viæ. In many cases, the internal use of arsenic has been found of signal benefit. And, when sarsaparilla, iodide of potassium, arsenic, fail, a cautious course of mercury may be administered, with good prospect of advantage. The unhealthy cavities made by suppuration are to be exposed by potass, freely applied ; and then sound cicatrization may be expected.

Erectile Tumour of the Tongue.

The erectile tumour may form in this organ. A few examples are on record. If the diseased structure be limited and accessible, it is to be removed by inclusion in ligature. If it involve the whole organ, or be otherwise not amenable to deligation, attempts may be made to induce a remedial change of structure, either by ulceration or by plastic exudation.—(*Principles*, p. 475.) Failing this, the disease must be regarded as beyond the reach of our art. Deligation of both lingual

arteries has been practised ; but with a result such as not to invite repetition ; fatal sloughing of the organ ensued.*

Removal of Portions of the Tongue.

On account of malignant disease, occult or open, as well as on account of erectile tumour, it may be necessary to remove a part of the tongue. Malignant disease involving the whole organ may be safely regarded as irremediable.

Carcinoma and Cancer show their ordinary characteristics here, and follow their usual course. A detailed statement of the symptoms and progress of such affections is therefore unnecessary. (*Principles*, pp. 552, 555.)

The removal may be effected either by knife or by ligature. The former is employed when the doomed part is situated anteriorly, and not extensive ; hæmorrhage, under such circumstances, being readily under control. By a volsella the changed part is seized, stretched, and made to project outwardly ; and by a bistoury satisfactory ablation is leisurely and carefully effected. Hæmorrhage having been arrested, the wound is either approximated or not, by suture, according to its size and form. In all other cases, at all practicable in site and extent, the ligature is preferred. A stout cord is passed on the proximal aspect of the diseased part, in sound texture, by means of a large needle in a fixed handle, as recommended for erectile tumours, (*Principles*, p. 473 ;) the noose of the ligature having been divided, each half is drawn tight separately, so as to completely isolate and strangulate the doomed portion ; and it is well to make a notch with a knife in the line of constriction, previously, so that the strangulation may be at once complete. By whatever mode the removal is effected, the prognosis need be but gloomy ; for it can be readily understood, how return of malignant disease is but too probable, in an organ which has been but in part taken away.

A proposal to reach deep-seated affections of the tongue, by a preliminary incision below the symphysis menti, is

* LISTON'S *Elements of Surgery*, p. 409.

not likely to find favour in the eyes of the discreet and the humane.

Division of the Frænum.

In the child, the frænum linguæ may be so short as greatly to incommode the organ ; at first impeding suction, afterwards embarrassing articulation. Or the defect may be more accurately expressed, perhaps, as an anormal prolongation forwards of the frænum, tying down the apex of the tongue. The faulty texture is readily divided, by means of probe-pointed scissors—the point of the tongue being elevated, so as to stretch the part, by the finger, or by means of a split card ; and, by cutting rather on the jaw than on the tongue, troublesome bleeding by wound of ranine vessels is sufficiently avoided.

In the adult, a somewhat similar condition of tongue-tie may supervene, in consequence of troublesome suppuration beneath the tongue. In cicatrization, the apex of the organ is drawn down, and becomes confined by a dense band of adventitious formation. This spurious frænum may be dissected through ; and, by dint of careful dressing, a more favourable cicatrix may be obtained.

Stammering.

Hesitations in speech were, within these few years past, made an apology for the perpetration of much unwarrantable cruelty, under the title of remedial operation, practised upon the tongue. However, the distinguished author of the procedure—and otherwise excellent surgeon—has happily abandoned such modes of cure. And the cases are once more reposed within the exclusive care of the elocutionist.

Ranula.

Ranula denotes a tumour formed beneath the tongue, in consequence of obstruction of one or both of the salivary ducts ; consisting of a cyst, produced by expansion of the duct and condensation of the surrounding parts ; and of clear

contents—perverted secretion of the cyst, and of the corresponding salivary gland. Inconvenience is felt in mastication, deglutition, and articulation ; indeed, the term *Ranula* has been applied, on account of the croaking deterioration of voice. The tumour is distinctly seen, on elevation of the apex of the tongue ; and but slight manipulation is necessary to ascertain its cystic and salivary nature.

Two modes of treatment are applicable ; restoration of the normal opening, or the making of an artificial substitute. In recent cases, the former method may succeed. The occluded original orifice is dilated, by probes of suitable dimensions ; and the due degree of patency and calibre is subsequently maintained, by the occasional passage of a bougie or probe for some time afterwards. In most cases, however—as in the somewhat analogous circumstances of subcutaneous encysted tumour—the normal orifice cannot be detected and restored. An artificial opening is made, at an anterior and dependent part. The contents readily escape ; but they speedily re-accumulate ; and the difficulty in the case consists, in the keeping of this artificial opening so patent as to allow of constant discharge, and consequent contraction of the secreting cyst to the capacity and character of the original duct. To effect our object, it is well to touch the aperture, frequently, with a true caustic—as the *potassa fusa*—so, as it were, to compel cicatrization of the margins, without closure. And this object may be further facilitated, by the occasional use of a large probe or bougie, after the caustic has been disused. Failing in our attempts thus, a seton is passed through the cyst, and retained until the requisite contraction is obtained. A piece of silver wire—retained by twisting of the ends—is found to be more suitable than the caoutchouc tape, or skein of silk or cotton.

Tumours beneath the Tongue.

Encysted tumours are not unfrequently found in this situation ; simulating the condition of *ranula* very closely. The cyst is thin ; the contents are clear and glairy ; the size may be considerable. The remedy is by incision and cauterization. The cyst is opened anteriorly by a free puncture ; the

contents are allowed wholly to escape ; and then to the lining membrane is applied either the nitrate of silver firmly, or the potassa fusa lightly ; care being taken to confine the escharotic action to the part intended. After the use of the potass, rinsing of the mouth repeatedly with vinegar and water is a safe and prudent precaution.

Fatty tumours beneath the tongue have also simulated ranula. The attachments are delicate and loose ; and, for extirpation, little more than mere incision of the investing membrane is sufficient. For obvious reasons, removal by the knife cannot be practised too early.

In the after treatment of suppurating wounds in this locality, it is very plain that care must be taken, lest, by cicatrization, the condition of tongue-tie become established.

Salivary Concretions.

Concretions form in the extremities of the Whartonian ducts, more frequently than in connexion with the parotid gland ; with, or without obstruction of the saliva's course. The inconvenience is considerable, by the bulk and irritation of the foreign substance ; and, by manipulation and the use of the probe, the presence of the concretions can, in most cases, be very readily detected. When of large size, they become fully exposed, in the progress of working their own way out by ulceration, after the manner of a sequestrum, or any other foreign substance. The operation for removal is simple ; after suitable incision, the calculus is laid hold of by forceps and extracted. But when the foreign body is small, and the containing cavity large, it may retreat, and elude the attempts at seizure. In such a case, let the patient masticate any agreeable article of food ; and by the outward current of the induced saliva the concretion will be either washed away, or at least made prominent and superficial.

CHAPTER XIV.

AFFECTIONS OF THE UVULA AND TONSILS.

Œdema of the Uvula.

ŒDEMA of the Uvula, with a relaxed state of the neighbouring soft palate, may occur singly ; but more frequently it is a result of an imperfectly resolved inflammatory affection of the general fauces. There is a feeling of very considerable discomfort in the part ; the quality of the voice is deteriorated ; articulation is impeded ; and not unfrequently a tickling and annoying cough is occasioned. The various astringent gargles are of service ; with attention to the general system. Failing these, stimulants and astringents may be applied directly to the part, in solution or in powder ; as alum, capsicum, &c. Or the part may be gently touched occasionally with the nitrate of silver, either in substance or in solution. In obstinate cases, it is well to precede the use of the last-named remedy by scarification.

Elongation of the Uvula.

Relaxation of the uvula, with elongation, is of no unfrequent occurrence ; the extremity of the elongated organ passing downwards, and by titillation of the glottis causing a very unpleasant and sometimes distressing cough. Sometimes the extremity is œdematous and bulbous ; sometimes it is thin and fimbriated. In the slighter cases, the ordinary astringents and stimulants may be tried. But when the elongation is considerable, as regards both extent and duration, there is no suitable remedy but by abbreviation ; and that has never yet been followed by any untoward consequences. The patient, seated before a good light, is directed to cough, so as to bring the pendulous uvula on the dorsum of the tongue, with its apex pointing outwards ; and then a suitable portion may be cut off by the stroke of sharp cutting scissors—probe-pointed, lest the patient should prove unsteady. Or by a volsella the apex is laid hold of ; and then,

by stretching the part, its section will be facilitated, as well as rendered more accurate. Complete extirpation of the uvula has been recommended in such cases, on the plea that relapse is otherwise probable. But, even supposing the fear to be justly founded—which, in my experience, it is not—such a ruthless proceeding is scarcely warrantable; the organ being doubtless endowed with some useful function in the general economy.

Tonsillitis, or Cynanche Tonsillaris.

This term denotes an inflammatory affection of the fauces, chiefly resident in and around the tonsils; ordinarily the result of atmospheric exposure; and characterized by swelling, redness, heat, and pain of the part, impeded and painful deglutition, inability to separate the jaws, difficult articulation, marked alteration of the voice, and the ordinary constitutional accompaniments according to the intensity and advancement of the action. The treatment is by ordinary antiphlogistics, local and general. Scarification of the part is sometimes advisable, with the view of abstracting blood, controlling swelling, and rendering suppuration less likely to supervene. Sometimes, large doses of Guaiac—half a drachm of the powder, thrice daily—have a resolutive and almost specific influence. The affection may prove formidable by assuming the erysipelatous type, and spreading downwards, into the air passages.

Abscess of the Tonsil.

An acute abscess, of some size, in the tonsil, requires active surgical interference. If allowed to follow its own course, much distress is likely to be occasioned by pain and swelling, ere evacuation and subsidence take place; indeed, the swelling may be such as not only to prevent deglutition wholly, but also to impede respiration and threaten asphyxia. Besides, the spontaneous bursting of the abscess may be during sleep; and a considerable quantity of pus and blood passing suddenly into the glottis, unexpectedly, may induce a spasmodic dyspnoea of the most formidable character, and

may not improbably suffocate the patient. To avert such pains and perils, the general principles of surgery should be fully carried out ; by artificially evacuating the pus, so soon as it has been formed. This may be readily and safely effected thus : The patient, placed before a strong light, is exhorted to great steadiness. With the fore-finger of the left hand the tongue is depressed, and the mouth opened, so as to expose the red and prominent tonsil—perhaps already occupying the mesial line of the fauces, and displacing the uvula, the ordinary occupant of that space. A straight sharp-pointed bistoury, with its back resting on the tongue, is passed into the mouth and entered into the centre of the swelling, with the point directed straight backwards, as if with the intention of impinging upon the anterior surface of the cervical vertebræ ; and a puncture having thus been made, a sufficient aperture is then established by moving the instrument towards the mesial line with a slight sawing motion. The pus escapes upon the tongue, and is discharged externally. Lateral movement of the knife, outwards and backwards, is especially to be avoided ; otherwise important blood-vessels are in danger—the internal carotid artery and the internal jugular vein posteriorly, and the common trunk of the temporal and internal maxillary arteries on the external aspect.

A chronic condition of the inflaming tonsil is not unfrequent ; in which the organ remains swollen, painful, and stationary ; affording no sign either of recession by resolution, or of advancement by suppuration. Such uncertainty is best dispelled—and usually at once—by the application of a blister over the part, beneath the angle of the jaw ; one or other event is speedily determined.

It is of use to remember, that a patient once affected by tonsillary abscess is extremely liable to a return of the affection, on the application of comparatively slight causes, until the first period of adult age has passed by ; and then the attacks become less frequent and severe, at length altogether disappearing.

Ulcers of the Tonsils.

The tonsils are liable to ulceration from ordinary causes ;

from exposure to cold or wet, from the irritation of decayed teeth, or from the irritation of the coming of the last grinders. The treatment is by touching the part occasionally with the nitrate of silver, after removal or mitigation of the cause—removal of the decayed teeth, or scarification of the tense gum.

Other ulcers of the tonsils are of constitutional origin ; connected with taint of system, venereal, mercurial, or both ; sometimes of secondary, sometimes of tertiary accession ; the local characters of the sore varying, according to circumstances—simple, weak, indolent, irritable, inflamed, sloughing, or phagedænic. Treatment, in such cases, is mainly constitutional.

Hypertrophy of the Tonsils.

In adolescents of weak habit, chronic enlargement of the tonsils is very apt to occur, connected with a minor inflammatory affection of the fauces ; the swollen part partially and slowly subsiding between the inflammatory attacks, which are of frequent occurrence and induced by slight causes. In such cases, it is not uncommon for the tonsils to become permanently enlarged, by simple hypertrophy. Both are, in general, similarly affected ; projecting, as fleshy eminences, into the fauces ; interfering considerably with deglutition, somewhat with respiration, and greatly with articulation ; often causing deafness, by pressure on the Eustachian tubes ; and rendering the patient very liable to inflammatory affections of the fauces, on the slightest exposure to atmospheric inclemency or vicissitude.

In the state of excitement, mild antiphlogistics are necessary for a few days ; low diet, aperients, gentle diaphoresis, sinapisms or other light counter-irritation. In the indolent state, it is our object to amend the general health by a tonic system of general treatment ; to obtain gradual subsidence of the swellings by discussion ; or, this failing, to effect ablation of the redundant texture. As discutients, nitrate of silver, alum, and iodide of zinc, are most in use ; the two first rubbed on the parts in substance ; the last applied in strong solution, by means of a hair pencil or a piece of sponge. The constitutional treatment is as for the strumous

cachexy—a condition very similar to, if not identical with the state of system found to prevail in such patients, (*Principles*, p. 211.) When discussion fails, the use of the knife is expedient; not to extirpate the glands, but merely to remove the redundant and projecting parts. The mouth being opened before a strong light, the prominence of the swelling is seized firmly by a volsella; and by means of this instrument the part is made tense and steady, and brought more into the central space. A probe-pointed bistoury is passed into the mouth, with its back resting on the tongue; and its edge having been brought in contact with the lower part of the base of the swelling, division upwards is effected by a slight sawing motion. A similar procedure is repeated on the opposite side. Bleeding and pain are but inconsiderable. The raw surfaces, which remain, granulate and heal; occasional application of the nitrate of silver being lightly made, if need be. It is seldom that reproduction is even threatened.

Extirpations of the entire tonsil, by ligature, or by knife—the one operation very hazardous, the other accomplished with great difficulty—are in the present day never contemplated; being well superseded by the partial ablation just described.

CHAPTER XV.

AFFECTIONS OF THE PHARYNX.

Pharyngitis.

THE inflammatory process, affecting the pharynx pre-eminently or solely, is of comparatively rare occurrence. Most frequently it is the result of a direct exciting cause; as the lodgement of foreign bodies, or the contact of acrid substances. The membrane becomes red and swollen, at first dry, afterwards affording an increased and perverted secretion; deglutition is difficult and painful; pain is felt on pressure from without; and the ordinary constitutional

symptoms attend. The action may simply resolve ; or ulceration may take place in the membrane, with copious purulent discharge ; or the submucous tissue may become the seat of abscess ; or by submucous deposit of plastic matter, and change of structure in the membrane itself, contraction of the pharyngeal space may result.

Pharyngeal Abscess.

When matter has formed beneath the mucous membrane, a fluctuating yet tense swelling may be perceived ; and deglutition becomes more and more impeded, according to the increase of the tumour. The treatment is by early and free evacuation. The ordinary site of the abscess is on the posterior aspect of the pharynx, in front of the cervical vertebræ and their coverings ; and here cutting instruments may be used in all security. If the abscess be large, it is well to use a trocar and canula, for evacuation ; lest the pus, suddenly escaping in quantity, might endanger suffocation by passing into the windpipe. If opening be delayed, not only are risk and inconvenience great by the large size of the tumour ; there is the same danger from sudden spontaneous discharge, as in abscess of the tonsil ; besides, the bones may be involved by the burrowing of the matter ; and, by the ultimate cicatrization of a large cavity, contraction and stricture of the pharynx may result.

Stricture of the Pharynx.

Simple stricture may be the result of simple pharyngitis, causing structural change in the mucous membrane, with accumulation of plastic deposit in the submucous tissue ; and on the latter occurrence the contraction mainly depends. Or it may be the consequence of ulceration of the membrane, with or without suppuration in the parts beneath. The prominent and characteristic symptom is difficulty of swallowing, more especially of solid and imperfectly masticated articles of food. And certainty of the existence of the change is determined, by the use of a probang or tube, whose passage downwards is resisted by the contracted part. The ordinary

site of contraction is at that part of the cavity which is naturally most narrow—the lowest.

Malignant contraction is produced by carcinomatous formation in the mucous and submucous tissues; the surface speedily assumes the open condition, and much unhealthy matter is discharged. The symptoms are, great pain in the affected part, increased by motion and pressure; expectoration of foetid, copious, bloody discharge; great and increasing difficulty in swallowing; gradual wasting of the frame, partly by inanition, partly by the progress of the usual malignant cachexy.

The simple stricture is treated by dilatation. A probang—a rounded piece of whalebone, with a bulbous extremity made of ivory—is passed gently down to the obstruction; or a gum-elastic bougie may be used for the same purpose. One having been selected of such a size as will pass, without the use of force, it is lodged in the contracted part, and retained there for some time—according to the sensations of the patient. After a day or two, the irritation of the former instrument having subsided, another, a size larger, is similarly employed. And thus, gradually, the normal calibre is restored. An instrument of full size should be passed occasionally, however, for some time afterwards, to obviate the tendency to recontraction which exists in all mucous canals so affected. The object of the passing of instruments is, not to excite inflammation or ulceration in the contracted part; for this would plainly lead to ultimate aggravation of the morbid state; but to excite absorption of the submucous deposit, and a resolutive action, with discharge, in the membrane itself. At the same time, some little benefit is obtained by the mechanical dilatation.

The malignant stricture admits only of palliation. Great attention is paid to the administration of nutritious ingesta, so as to husband the surely failing strength; and the pain and discomfort are assuaged by opiates. Direct interference with the part, by means of bougies, or otherwise, with dilatation in view, cannot but do great harm. Often, however, the pain of the ulcerated surface may be relieved, by occasionally touching it with a solution of the nitrate of silver.

Spasm of the Pharynx.

In patients of nervous temperament, with stomachs and bowels disordered, and prone to hysteria, spasm of the muscles of the pharynx is not an unfrequent occurrence ; causing pain in the part, with an uneasy and apprehensive feeling of tightness, and materially interfering with deglutition. The attacks are only occasional, sudden in accession, and gradual in remission. The treatment is mainly constitutional ; of an alterative, tonic, and antispasmodic character. Locally, external counter-irritation of a slight grade, or opiate friction, may be of service.

Paralysis of the Pharynx.

This, occurring in the sequel of any disease, is usually of very unfavourable import ; denoting affection of the brain, probably by effusion, which is likely to prove fatal. It may occur singly, however ; as after external injury of the head or neck ; and then the prognosis may be somewhat more hopeful. The prominent symptom is simple dysphagia ; without obstruction to instruments, or any other sign of stricture of the passage. The curative treatment is to be directed mainly to the head and neck, by counter-irritation, and such internal remedies as may seem advisable ; while life is meanwhile sustained by supplying the stomach with nutritive fluids, by means of a tube passed into the œsophagus.

Tumours of the Pharynx.

Tumours occasionally, but rarely, form in the pharynx. They are troublesome by the dysphagia which their bulk necessarily occasions, and dangerous by the tendency which all tumours have to enlargement and degeneration. They may be simple, and of the polypous character ; and these may be detached by ligature, applied to their base by means of a double canula. Or they are medullary ; and then irremediable.

Foreign Bodies in the Pharynx.

Portions of food, and other articles held in the mouth, not unfrequently become arrested in their passage downwards ; even though no anormal contraction exist at any part of the canal. Substances of some size and solidity are likely to rest at the narrowest—the lowest—part of the pharynx. Those of a slim and spiculated character, on the contrary—as needles, pins, fish bones, pigeon bones, &c.—are more frequently entangled in the folds of the soft palate. In both situations, the foreign matter is within reach of the finger ; and this is the best instrument by which to ascertain the exact site and nature of the lodgement—as well as the best guide to the forceps in extraction. A slight substance entangled in the fauces causes much discomfort ; and besides, if not removed, will probably induce a certain amount of inflammatory action. But the larger and solid substances, lodged lower down, call more urgently for our aid, inasmuch as by their bulk and pressure, and by the spasmodic movements which their irritation induces in the larynx, they threaten suffocation. The patient is seated firmly on a chair ; the fore-finger is thrust determinedly into the fauces ; and its point is moved about in every direction, until either the foreign substance is discovered, or the surgeon is satisfied that there is no foreign body there. Much retching will be occasioned, in all probability ; but this must be unheeded by the examiner, and endured by the patient ; the perquisition of the soft palate being got over as speedily as possible, as here are chiefly situated the extremities of the nerves concerned in emesis. The presence and site of the foreign body having been ascertained, it is seized by forceps, guided down by the finger, and is gently withdrawn. For pins and small bones in the arches of the velum, the ordinary dressing forceps, or merely the finger-nail, will suffice. For solid matter lodged lower down, longer forceps, gently curved at the extremity, are more suitable.

It is important to remember that very frequently the painful sensation of a foreign body lodged in the pharynx remains, after the substance itself has passed down into the stomach. When, therefore, we have made a careful examination of the parts, and satisfied ourselves that no foreign

body is there, we treat such anormal sensation by leeching, followed by counter-irritation, or by anodyne embrocation.

The passing of Instruments by the Pharynx.

The surgeon is not unfrequently called upon to pass instruments into the pharynx and œsophagus ; curved forceps for the extraction of foreign bodies ; probangs and bougies for the propulsion of impacted articles of food, or for the relief of simple organic stricture ; hollow tubes for the conveyance of nourishment into the stomach, in cases of wound of the pharynx or œsophagus—as in cut throat ; and the tube of the stomach pump, in cases of poisoning. The points to be attended to are ;—to use all gentleness, so as to avoid læsion of the lining membrane of the canal ; and to take especial care, particularly when it is our object to throw in ingesta, that the tube does not pass into the air passage. If the patient be sensible, he is seated on a chair, with the head thrown much back, so as to bring the upper part of the alimentary canal into a straight line as nearly as possible. The mouth having been opened wide, and the tongue depressed with the left fore-finger, the tube is moved rapidly past the soft palate, so as to excite retching as little as possible ; and its extremity is then gently propelled, resting on the posterior part of the pharynx, and is made to glide, as it were, on the anterior surfaces of the vertebræ in its passage downwards. When the instrument's point is opposite the rima glottidis, the patient is directed to make an effort to swallow his saliva ; or, with the left hand, the surgeon raises the box of the larynx, and at the same time pulls it gently forwards from the œsophagus ; such movement of the larynx being plainly conducive to the free passage of the tube, bougie, or probang, into the latter canal. When insensibility exists, the operation is in one way facilitated ; inasmuch as there is no resistance on the part of the patient. But, in such cases, it is plain that our care to ensure a right passage for the instrument must be doubly exerted ; the patient failing, by his sensations, to warn us of a threatened deviation from the proper track. In most cases, it is well to assure ourselves fully that the tube is in the œsophagus, and not in the larynx, before

fluids are passed downwards to the stomach. For this purpose, a sheet of paper is placed over the face, with the extremity of the tube projecting through it ; and a lighted taper is placed in front of the tube's opening, which by the paper is effectually screened from the flatus of the nostrils in expiration. If, on expiration, the flame remains steady, no air impinging on it, we may proceed with injection ; the tube is certainly in its right place. If the flame be extinguished, or even made to bend considerably, it is equally plain that an error has been made ; and that injection would almost certainly occasion a fatal asphyxia. It is possible, however, that the flame may be affected a little in expiration, although the tube be quite in its right track. For, it is probable that in inspiration a certain amount of air passes downwards by the tube, which during expiration may be again extruded.

It is well to remember how a large instrument is preferable, in such cases, to one of small size ; being much less likely to enter into the windpipe. And it is also worthy of note, how, in emergencies, a syringe is not essential to effect clearance of the stomach ; for, a tube having been passed, the fluid contents of the stomach may be made to flow out by it, on merely bending the body, and bringing the mouth to a lower level than that of the epigastrium. When a syringe is employed, it should always be with caution ; otherwise, ecchymosis and laceration of the gastric mucous membrane are not unlikely to be produced.

CHAPTER XVI.

AFFECTIONS OF THE ŒSOPHAGUS.

Stricture of the Œsophagus.

Œsophagitis, of a most intense character, is occasionally induced by the swallowing of acrid fluids ; as scalding water, the nitric or sulphuric acids, &c. A much more moderate action may be induced by slighter causes, or may occur when no cause can readily be assigned ; and its probable result

will be a contraction of the canal, partly by change of the mucous membrane, partly and mainly by submucous deposit.

But contraction of the œsophagus may be of three kinds, as in the case of the pharynx. It may depend on spasm; of sudden accession, and only occasional; removable by general treatment. Or it may be the result of a chronic inflammatory process; of gradual approach, constant, and curable only by the cautious use of the simple probang or bougie. Or it may be caused by structural change of a malignant kind; carcinoma, followed speedily by ulceration; and capable only of palliation.

The simple organic stricture is of most frequent occurrence. Its ordinary site is at the narrowest part of the canal; opposite the cricoid cartilage. When tight, and of considerable duration, the pharynx is prone to become dilated above the strictured part, forming a large pouch in which food inconveniently accumulates. Above the stricture, too, ulceration is apt to take place; which, though not malignant, is nevertheless very intractable, and most inconveniently complicates the case. Besides, in consequence of the obstruction to deglutition, the system is apt to suffer more or less by an approach to inanition; and, therefore, it is very apparent how it is our duty to commence the suitable remedial interference at as early a period as possible. In using the bougie, more gentleness and care, if possible, are expedient, than in the case of strictured pharynx; force being more likely to effect lœsion of the membrane, and even to cause perforation of the tube. It has happened that the head of a probang, supposed to have passed near to the stomach after having overcome the stricture, has been found, after death—at no distant date, and not unconnected with the event—to have lodged in the mediastinum! Another precaution is equally necessary; namely, to beware that there is no error in our diagnosis; to be certain that the contraction is really caused by structural change in the œsophagus itself, and not dependent on the pressure of an aneurismal or other tumour. It is easy to understand how the thrust and pressure of a probang or tube, acting on the parietes of an advancing aneurism, may fearfully accelerate the fatal issue by opening of the sac.

Foreign Bodies in the Œsophagus.

Foreign bodies, whether obtuse and globular, or sharp and angular—portions of meat, or bones, pins, &c.—become arrested usually at the narrowest part of the canal, nearly opposite the cricoid cartilage. Or, lodging there in the first instance, they become displaced either upwards or downwards—usually in the latter direction—by the efforts either of the patient or of those whom he calls to his aid. The result varies, according to circumstances. There may be simply an irritation produced by the presence of a foreign body, with more or less dysphagia; or an inflammatory process is kindled, and advances perhaps to suppuration and ulceration; or by the pressure and irritation of a bulky substance, life may be immediately perilled by impending asphyxia. Or, as very frequently happens, the foreign body slips down into the stomach; leaving, however, a marked sensation of its presence at the site of its temporary arrest.

The presence of foreign matter is ascertained by the bent forceps, or by the probang; passed carefully down, and moved gently. According to the nature of the substance, either extraction or propulsion is practised. If the obstructing body be a piece of meat, or other article of food, not likely to injure the canal in a forced passage, and capable of being digested, on the stomach having been reached, it is the simpler practice—and one perfectly warrantable—to push the foreign substance gently downwards by means of the probang. When, however, the circumstances are of an opposite character; when we are satisfied that the Œsophagus cannot fail to sustain læsion in attempts at propulsion, and that the stomach will be unable to make any satisfactory impression on the substance, should it be received there, extraction is invariably to be had recourse to. And it can be readily understood, how this will, consequently, be found preferable to propulsion in the great majority of cases. Long, curved forceps are the most generally available instrument; the surgeon being provided with two pairs, of opposite movements in the blades. The one having missed the foreign substance, when narrow, or flat, the other may scarcely fail to seize it. The seizure having been made, dislodgment from the parietes of the

canal is to be effected, by a cautious wriggling movement of the hand, before extractive power is applied ; to avoid unnecessary læsion of the parts. Needles or pins may be entangled in loops of thread attached to the end of a piece of whale-bone ; passed down to the site of lodgment, and moved gently about. Flat substances, such as coins, presenting their edges to the operator, may be brought up by a flat and broad blunt hook, similarly employed. When no instrument is at hand, and the case is urgent, extrusion of the foreign substance may be effected, by exciting vomiting ; and this may be done either by administration of the ordinary emetics, if swallowing be at all practicable, or by mechanically tickling the fauces.

When indigestible substances have passed into the stomach, they usually find their way to the surface, by the natural outlet—per anum ; passing off with the fæculent matter—often but little changed—after the lapse of some time. To assist the downward movement, purgatives are often employed. If the foreign body be solid and obtuse, no harm is done, and extrusion will probably be expedited. But if the substance be sharp and spiculated, the practice cannot but be mischievous ; tending to produce entanglement in the mucous membrane, probably with perforation of the bowel ; and also tending to kindle inflammation in the affected part. In such cases, therefore, it is more prudent to await the working of Nature. Needles and pins usually do perforate the intestinal canal ; but, if left to themselves, the process is gradual, accompanied by protective plastic exudation, and consequently harmless. In due time, the foreign body appears at the surface, as if soliciting extraction—it may be months after the date of its entrance, and after having traversed a most circuitous route. Fish-bones, and bones of rabbits or other small animals, are not unfrequently arrested above the sphincter of the anus, after having safely made the passage above ; and may require the use of the knife, as well as of forceps, for their removal.

Occasionally, though rarely, it happens that the foreign body will move neither up nor down in the œsophagus. Extrusion and propulsion having both failed, excision is the

only other resource. The substance is cut down upon from without, and extracted through the wound.

Œsophagotomy.

The neck is stretched, by elevation and retroversion of the head ; and, by the fingers of an assistant, the foreign substance is made to project as much as possible on the left side of the trachea. A free incision is made over the swelling, through the skin and platysma myoides ; and, then by a cautious and more limited use of the knife, the œsophagus is exposed, at its most projecting part. Here it is penetrated by the knife ; and the opening thus formed is afterwards dilated to a sufficient extent, partly by the finger, partly by slight touches of the edge of the knife. The offending matter is laid hold of, by the finger or by forceps, and removed. Hæmorrhage having been arrested, the wound is brought accurately into apposition, and treated for adhesion. For some days a tube is worn, passed by the mouth ; and through this the necessary nourishment is conveyed, clear of the wound.

It may be imagined, that foreign substances may be safely left to loosen themselves by suppuration, and so to facilitate, if not effect, their own extrusion. But experience declares that it is not so. The obstruction to deglutition, and impediment to breathing, are themselves circumstances so sufficiently untoward as usually to demand prompt interference. The inflammatory process, too, which is sure to follow, is fraught with both disadvantage and danger ; it may lay the foundation of a formidable organic stricture ; it may cause a troublesome abscess, resulting perhaps in a fistulous opening in the canal ; or, in a low site, the ulceration may open into the arch of the aorta, and prove speedily fatal.

CHAPTER XVII.

AFFECTIONS OF THE EAR.

Foreign Bodies.

CHILDREN are apt to insert foreign matter into the meatus auditorius, as well as into the nostrils. Dislodgment and extrusion are effected by the same means; by the stream of water injected; or by the use of a flat and bent probe, or curette. Forceps are a still more reprehensible instrument here, than in the case of the nostril; for impaction is not only more probable, but likely to be attended by much more serious results. Abortive attempts to dislodge, by forceps, have occasioned deeper lodgment, disruption of the internal ear, intense otitis, and death.*

Polypus of the Ear.

Two forms of Polypi may form on the lining membrane of the meatus externus; one soft and pulpy, analogous to the common mucous polypus of the nose; the other more firm and fleshy, resembling more the solid polypi of the vagina; both simple in structure and tendency. Deafness is occasioned, along with uncomfortable sensations in the part; and more or less discharge escapes, of a puriform character. The treatment is by evulsion; slim forceps being employed for this purpose, as in the case of nasal polypus. By the use of the ear-speculum, cautiously introduced—an instrument similar to the nasal speculum, only of a more tubular extremity, suited to the cavity which it is intended to explore—the site of attachment is ascertained; there the seizure by forceps is made; and, by slight torsion combined with evulsion, extirpation is effected. When bleeding has ceased and pain subsided, it is well to touch the part firmly by nitrate of silver, so as to diminish the chance of reproduction.

* *Lancet*, No. 1062, p. 458.

And if the morbid structure should not have been entirely removed, such slight cauterization may require repetition from time to time. During the healing process, relaxation of the membrane, with copious discharge, is apt to prove troublesome ; demanding the daily and repeated use of gently stimulating and astringent injections.

Fungoid granulations, of a polypous character, not unfrequently spring from the membrane of the meatus, in cases of long-continued otorrhœa. They are got rid of by the nitrate of silver, used escharotically, and by the subsequent employment of astringent injections.

Otitis.

The inflammatory process may attack the mucous membrane of the ear, and the textures connected therewith, either on the exterior or on the internal aspect of the membrana tympani : in the one case the affection is said to be external ; in the other, internal.

External Otitis.—This most frequently occurs in the young ; the result of exposure to cold, with or without irritation caused by affections of the teeth or gums. It constitutes the common earache, from cold ; the pain being that which attends on the ordinary inflammatory process, occurring in a part of extreme sensitiveness. The action may simply resolve ; or it may cause a puriform exhalation from the membrane ; or abscess may form beneath the membrane, pointing, discharging, and causing much aggravation of distress. The treatment is simply antiphlogistic ; leeching behind the ear, fomentation, hot poultices, purges, and antimony. When abscess forms, the activity of the application of heat and moisture is redoubled ; and as soon as the appearance of matter is presented, evacuation is effected by puncture.

Internal Otitis is a more serious affection ; and may be variously induced ; by injury, exposure to cold, or extension of a more outward attack. The pain may not be more acute, but is deeper seated and more intolerable ; attended with throbbing, and confusion of the head ; and the system sympathizes in well marked inflammatory fever. If the action proceed to suppuration, disruption of the internal ear, with

loss of hearing, is all but inevitable. The treatment is actively antiphlogistic. When certain that acute internal otitis exists, we will not content ourselves with leeching behind the ear; but will take blood both from the part and from the system. Calomel and opium, too, will be administered; the invasion of an organ of delicate texture, of important function, and in near connexion with the brain, being sufficient warrant for such procedure. In short, the best efforts will be made, early and satisfactorily to subdue the rising process, so as to prevent suppuration if possible. When matter has formed in the cavity of the tympanum, the membrana tympani acts injuriously by repressing the outward discharge of the abscess; occasioning tension, with aggravation of the symptoms. Here the general rules of Surgery are to be fulfilled; by incising the tense, resisting membrane, which is seen white and prominent, so soon as we are satisfied by its change of colour and form, and the course of the general symptoms, that intra-tympanal suppuration has taken place. The membrane must yield ultimately, by ulceration or sloughing; probably too late to save the delicate and complicated apparatus of hearing from irreparable injury; perhaps too late to prevent extension of the aggravated inflammatory action to the brain or its membranes.

Otorrhœa.

By this term is understood a puriform or purulent discharge from the ear; the result of a chronic inflammatory process. Usually it is preceded by the ordinary signs of an attack of otitis, acute, or subacute in character. Children are most liable to this affection; and especially those of strumous habit. It is well to examine the meatus attentively, by means of the speculum, discharge having been previously removed by gentle ablution. For if the membrana tympani be found entire, and tolerably sound, the affection is so declared to be comparatively simple; whereas, if that membrane be found imperfect, denoting an internal origin of the suppuration, prognosis is rendered more guarded and unfavourable.

The treatment is mainly palliative and expectant, as regards the part; restorative, as regards the system. The con-

stitutional cachexy is to be combated by the usual means. The ear is kept clean by repeated and careful use of tepid water, without and within the meatus. The state of the mouth is looked to ; and, if need be, amended. Re-accessions of inflammatory action are averted or subdued, by occasional leeching and fomentation, as circumstances may require. The chronic action which is maintaining the structural and functional disorder of the mucous membrane, is sought to be overcome by careful counter-irritation—blistering behind the ear ; this, however, being proceeded with cautiously, lest enlargement of the glands of the neck, which frequently is an accompaniment of the otorrhœa, should be either induced or aggravated. When nearly all the symptoms of inflammatory action in the part have subsided, and when the general system has decidedly improved, astringents may be employed, to favour recovery of the membrane, and consequent cessation of the discharge. This part of the treatment, however, must always be conducted with the greatest possible caution ; lest, by sudden arrest of the discharge, return of the inflammatory attack, in a deeper site, and in an aggravated form, should unhappily ensue. Such risk is in all cases great, when sudden arrest of discharge has occurred, from any cause ; but especially in those cases in which implication of the internal ear is indicated, by imperfection of the membrana tympani, and perhaps discharge of the ossicula auditus.

There is a class of cases, in which head-symptoms of an alarming, or at least of a suspicious character, undergo a marked and rapid mitigation on the occurrence of discharge from the ear. In such, it were an obvious and wholly inexcusable act of folly, to attempt arrest of the discharge, even by the most simple means.

Otorrhœa is occasionally connected with a degenerated condition of the pars petrosa of the temporal bone ; which has softened, and become converted into a medullary mass. The symptoms are cerebral and obscure. The issue is hopeless. And it is very plain, that the fatal event would certainly be much accelerated by a successful attempt to arrest the aural discharge.

Abscess of the Mastoid Cells.

Inflammatory action may originate in the cancellated texture of that part of the temporal bone which constitutes the mastoid process. It may be the result of external injury; more frequently it occurs without any appreciable exciting cause, in systems of the strumous character; and is most especially liable to invade those, whose original cachexy of system has been aggravated by the imprudent exhibition of mercurials. Like the preceding affection, it is most frequent in the young. If suppuration be attained to—as is extremely probable—the condition of true caries may hardly fail to be established; and is usually complicated with necrosis, portions of the osseous texture separating in the form of sequestra. Sometimes the affection is of a secondary character; the result of extension of internal otitis, which has, by suppuration, caused disruption of the internal ear.

Supposing the affection to be primary, our treatment in the first instance will be directed to averting suppuration and caries, if possible, by the ordinary means. When there is reason to believe that matter has formed, we shall be very anxious to effect an early and sufficient opening externally, and thus to limit the mischief already done. Otherwise, there is great danger by extension. The internal ear having been involved, hopeless deafness will ensue; paralysis of that side of the face is not unlikely, from implication of the portio dura; nay, it is possible that the contents of the calvarium may be attacked, directly and imminently perilling existence. But, independently of such aggravations, life may be hazarded by the hectic of a continued and wasting discharge.

If caries be established, the ordinary treatment is to be followed out; by free exposure of the part, and removal of the carious surface. (*Principles*, p. 329.) From local treatment alone, however, but little good may be expected; constitutional means must be at the same time, and sedulously, employed.

Otalgia.

This constitutes true earache; a neuralgic affection, unconnected, directly, with the inflammatory process. Very fre-

quently it is connected with irritation in the mouth. The pain is very distressing, and has all the characters of neuralgia. It is amenable to the same treatment, (*Principles*, p. 525;) search for a dental cause or connexion never being overlooked. Among the anodynes suitable for application to the part, aconite deserves to hold a most prominent place.

Deafness.

Deafness may proceed from the affections already mentioned, and from many causes beside. In order to arrive at a true diagnosis, careful examination of the external meatus, and of the membrana tympani, is essential; and to effect this, the well made speculum is of great service. Lately, a prismatic auriscope has been brought into use, by Dr. Warden, of this city. In obscure and complicated cases, its additional light may be made of avail for elucidation; but for ordinary cases the ordinary instrument is quite sufficient.

Deafness is very frequently occasioned by *Accumulation of inspissated Cerumen* within the meatus. Or, perhaps, the obstruction to the vibrations of sound is rendered still more effectual, by commixture of wool or cotton with the cerumen; the patient having been in the habit of negligently stopping his ears, as well as of forgetting to attend to requisite cleanliness. The presence of the obstruction will be at once declared by the use of the speculum; often that is not necessary; tension and straightening of the tube, by pulling the lobe, before a clear light, being sufficient. The remedy is by removal of the offending mass. And this is best effected by washing out the meatus with hot water, by means of a stout syringe. Instruments such as employed for gonorrhœa, or for the injection of sinuses, are wholly inefficient; the syringe must be of brass, well valved, and of considerable power. And the injection is persevered in, either at one or at repeated sittings, until the membrana tympani is disclosed clear, on the use of the speculum. When the cerumen proves unusually hard and tenacious, it may be loosened, previously to the syringing, by the careful use of the flat end of a probe, or by moistening it with bland oil for a day or two.

A deficiency of ceruminous secretion, is an occasional, but

much less frequent cause of deafness. The meatus is found dry and empty, and the membrana tympani is seen clear and glistening. Stimulants are of use, in restoring the secretion—as the essential oils, more or less diluted; and their action may be further assisted by stimulant friction around the auricle. Exhaustion of the cavity is said also to have a beneficial effect; by means of a syringe, fitted with a soft nozzle which completely occludes the meatus.

Thickening of the lining membrane of the meatus is a cause of deafness; the result of a chronic inflammatory process. It is to be treated by the application of gentle stimuli—such as solutions of the nitrate of silver, sulphate of zinc, &c.—which are best administered by means of a hair pencil. Rectification of the general health, and counter-irritation behind the ear, are often useful auxiliaries.

The membrana tympani may be changed in structure; thickened and congested; the result of inflammatory action. Similar treatment is advisable; the stimulants being applied by means of injection; except when the membrane is imperfect, and then again the hair pencil becomes preferable, lest undue excitement be caused in the internal ear. Imperfection of the membrane, by ulceration, or by rupture in consequence of external injury, is not remediable by treatment. The deficiency, however, may be repaired by Nature's effort.

The internal ear may be disordered; and on this cause the great majority of cases of deafness are found to depend. The change may be in the lining membrane, in the osseous texture, or in the nerves. Fortunately, modern research has declared the most usual site of disorder to be the texture first named—the one most amenable to successful treatment. This mainly consists in attention to the general health, and patient perseverance in the use of counter-irritation—the latter preceded by moderate local depletion.

The extremity of the Eustachian tube may be obstructed, in various ways, and deafness ensue. It may be shut up and compressed by enlarged tonsils, or by nasal polypus hanging low from the posterior nares. In such cases, deafness will disappear, on removal of the tonsil or polypus.

Congestive swelling and relaxation of the fauces may cause

obstruction. To be removed by astringent applications, counter-irritation, and attention to the general health.

Ulceration of the fauces, implicating the extremity of the Eustachian tube, may cause more serious obstruction, by the contraction which occurs on cicatrization. This is to be obviated by speedy healing of the ulcer, while it is yet superficial and of slight extent ; to be remedied—if possible—by the introduction of probes, or catgut bougies, whereby to effect gradual dilatation of the canal. The probe, or bougie, about six inches long, and sufficiently curved, is introduced along the floor of the nostril, with the convexity upwards ; and, just before the pharynx is reached, it is gently turned so as to bring the point outwards and a little upwards—the mouth of the Eustachian tube being above the level of the floor of the nostrils. If the tube is open, the instrument will be plainly felt entering it. When obstruction or obliteration exists, pressure is to be made in the direction in which the normal aperture ought to be ; in the hope that thus the obstruction may be overcome. Sometimes the operation is at least partially successful. But in too many cases, this as well as the other operations on the Eustachian tube are found to be not only difficult in performance, but also nugatory in their result.

By catheterism, as it is termed, it is proposed to rid the tube of a redundancy of mucus :—another cause of deafness ; but that will probably be both as easily and as safely accomplished, in most cases, by general treatment, gargles, and counter-irritation. In chronic affections of the membrane of the middle ear, it is possible that benefit may sometimes follow the careful injection of water, air, or medicated vapour, into that cavity ; and this is accomplished by means of the metallic Eustachian catheter—introduced in the same way as the probe, and fitted with a suitable syringe.

Organic change in the brain, or in the auditory nerve, is not an unfrequent cause of deafness ; and seldom admits of successful treatment. Hopes of amendment will mainly rest on counter-irritation, and on mercurialism moderately employed.

Functional disorder of the nerve is fortunately a more frequent, as well as a more hopeful cause ; variously induced—

as by blows, falls, loud noises, disorder of the general health, &c. Besides obviating the inducing cause, employing counter-irritation, and perhaps adventuring on mercurialism, benefit may be obtained from the endermoid use of strychnine—as in the analogous cases of functional amaurosis. Or, a few drops of an alcoholic solution of strychnine may be dropped into the ear, from time to time.

Determination of blood to the head, in consequence of suppression of a normal or habitual discharge, or however induced, is not unlikely to produce a certain degree of deafness, along with noises and other unpleasant sensations in the head. The treatment is by leeching or cupping, purging, and other means ordinarily found available to overcome the local plethora.

Perforation of the Membrana Tympani.

This little operation is not frequently required. It is deemed advisable when, by insuperable obstruction of the Eustachian tube, access of atmospheric air is denied to the cavity of the tympanum; and also when that cavity has become obstructed by extravasation of blood. The expediency of simple puncture, in the case of abscess of the tympanum, has been already noticed.

In cases of deafness, caused by obstruction of the Eustachian tube, it is our object not merely to make an aperture in the membrane, but to keep that pervious; and so permanently to atone for want of the accustomed atmospheric supply in the middle ear. This is best accomplished by using the instrument of Fabricci. “It consists of a canula, into which slides a spiral wire, somewhat resembling that of a cork-screw. It is to be used in the following manner:—Pass the canula with the spiral wire down upon the inferior part of the membrana tympani (so as not to interfere with the manubrium of the malleus), retain it there with the left hand, being careful not to press too firmly on the membrane; then, with the right hand, take hold of the small handle which revolves the spiral wire, and turn it from right to left, being what is usually called turning the *wrong way*. The instant at which the membrane is perforated is sensibly felt by the operator. The

wire is now no longer to be turned ; but by its handle the instrument is to be retained in its situation ; then gently revolve the canula, which has a cutting edge, from left to right, when a circular portion of the membrana tympani, corresponding to the diameter of the canula, will be cut out, and at the same time drawn into the canula and held fast by the spiral wire.”*

Hæmorrhage from the Ear.

Blood, escaping by the ear, may proceed from various sources, and requires different treatment accordingly. 1. One of the most prominent symptoms of fracture at the base of the cranium is bleeding from the ear ; amenable to no treatment ; and usually a most unfavourable omen. 2. Mere laceration of the lining membrane of the meatus may furnish a copious discharge of blood ; independent of any injury done to the cranium, or elsewhere. It, too, requires no treatment—not being likely to prove excessive. And it is not a sign of an untoward character. It may be the result of a blow, fall, or direct injury done to the part. 3. Passive hæmorrhage may take place from this, as from other mucous surfaces ; amenable to the ordinary treatment, local and constitutional, suitable in such cases. 4. The internal carotid may have been opened into by ulceration. The hæmorrhage is constant, copious, and of the arterial character. Pressure may be tried, but is almost certain to fail. The only sure remedy, is by ligature of the common carotid artery. 5. The lateral sinus, opened by ulceration, may be the source of the bleeding—dark, and venous. And in this case, while ligature of the carotid would prove wholly nugatory, moderate pressure is found to be quite effectual.

Hypertrophy of the Auricle.

Hypertrophy of the whole auricle is an occasional, though rare, occurrence. Partial hypertrophy—affecting the lobe only—is more frequently met with ; and chiefly in women.

* WILLIAMS on the Ear, p. 204.

If excessive, and irksome to the patient by means of its unseemliness, the redundancy may be removed by the knife.

Otoplastics.

Deficiencies of the auricle—by wound, ulceration, or sloughing—may be repaired by means of autoplasty. Restoration of the entire organ is scarcely to be attempted ; but a portion may be readily replaced—when laxity of the surrounding integument is favourable—by an operation conducted on the same principle as rhinoplasty.

Congenital Occlusion of the Meatus.

The meatus may be congenitally imperforate. It may be fully developed in all respects, but covered by integument. In such a case, simple incision of the skin, and careful dressing of the wound, so as to prevent contraction, will suffice to establish the normal state.

Or, a thick fleshy covering may conceal the cartilaginous tube, which is only partially developed. And in this case a more careful and regular dissection may attain to a similar result, but perhaps more imperfectly.

Or, the external apparatus of hearing may be altogether deficient ; the bone itself being imperforate. Such cases are wholly beyond the reach of our art : yet it does not follow that hearing is denied, or even very imperfect. And of this a striking example occurred to me some years ago. A boy, aged 14, came from a distance, desirous of having an aperture made in each auricle ; and each of these organs was found very imperfectly developed, of a shrivelled appearance, and wholly imperforate. On making a very careful dissection down to the bone, in search of an external meatus, it became apparent not only that no such tube existed, however imperfectly, but that also there was no aperture in the temporal bone. Yet the patient heard ordinary conversation, if distinct and rather loud ; he had gone to school at the same age as other boys, and had made equal proficiency in the ordinary branches of education, although no unusual means of teaching had ever been applied to him ; and he assisted his father

in the occupation of a butcher, with much smartness and intelligence. A series of experiments, conducted by my colleagues, Professors Forbes and Thomson, seemed to show that he heard mainly by conduction of sound through the bones of the cranium to internal ears very perfectly constructed.

CHAPTER XVIII.

AFFECTIONS OF THE NECK.

Glandular Enlargement and Abscess.

IN scrofulous adolescents, the glands of the neck are very liable to enlargement, by a chronic inflammatory process ; and frequently, notwithstanding every effort to the contrary, suppuration is attained to—causing more or less deformity, by unseemly cicatrization. In the nascent stage, we endeavour to arrest progress, by constitutional treatment suited to the strumous diathesis ; by leeching and fomentation ; and, subsequently, by the application of iodine, or other discutients, or by slight counter-irritation. When matter has formed, an early evacuation is practised by incision ; the wound being made as minute as possible, and in the direction of the folds of the neck, so that its cicatrix may escape observation. A common lancet is the preferable instrument. Sometimes, however, the use of the potass is demanded ; the integuments having been much undermined, and the gland requiring disintegration, (*Principles*, p. 193.)

In the after-treatment of suppurations in the neck, cure is often delayed by an over-dressing of the part—covering it with too many envelopes—especially when the patient is not confined to the house. The object of such dressing is to conceal the state of matters from public observation, and to guard against exposure to cold ; but the result is, to maintain a degree of congestion in the part, favourable to continued suppuration, and unsuited to contraction and consolidation of the abscess.

When abscess has formed at all deeply in the neck, whether

connected or not with glandular enlargement, evacuation by incision cannot be too soon had recourse to, otherwise serious mischief can scarcely fail to ensue. Fascia is made to slough ; cellular tissue is broken down ; the trachea and œsophagus are each liable to be opened into by ulceration ; the jugular vein may communicate with the abscess ; or, still more disastrously, by communication with the carotid artery, the cyst of the abscess may be converted into the sac of a false aneurism. And then, when the wound for evacuation—too long delayed—is at length made, the most serious consequences are inevitable. (*Principles*, p. 187, and 189.)

Tumours of the Neck.

Tumours also, when of such a nature as not to be amenable to discussion, call loudly for an early use of the knife, otherwise each day will but add to the difficulty and danger of the operation ; and when at last matters are found to brook no further delay, it is not impossible but the hazard may be found so much increased as to render any attempt at extirpation quite unwarrantable.

In connexion with this subject, it is well to remember, that in consequence of a tumour being bound firmly down by the deep and strong cervical fascia, it may seem to be less deeply seated than it is ; and that, consequently, much caution is always expedient in conducting the deep dissection, it being not at all improbable that the common sheath of the large vessels may be fully exposed—perhaps to some extent.

Opening of the External Jugular Vein.

Occasionally it is deemed expedient to abstract blood by opening this vein, at its lower part. By the pressure of the thumb, applied immediately above the clavicle, prominent bulging of the vein is produced ; and then an incision is made, as in venesection at the bend of the arm. The thumb's pressure is maintained, so long as the flow of blood is desired ; it is then withdrawn ; and this circumstance, of itself, is usually sufficient to arrest the bleeding. But, besides, it is well to place a small compress on the wound ; retaining it

by means of a long strip of adhesive plaster, or by means of a bandage very lightly applied.

Torticollis.

By this term is understood a distortion of the neck, dependent on muscular disorder—spasm, paralysis, or change of structure. The muscle usually to blame is the sterno-cleido-mastoid. One, acting with the undue energy of spasm, overpowers its fellow, and displaces the neck accordingly ; or one, affected with a loss of contractility, fails to afford the usual counteracting power to its fellow, and the result is similar ; or, by inflammatory action and its results, abbreviation and condensation of one or other muscle may occur, causing a distortion of a very unpromising character.

Children, shortly after birth, are not unfrequently found to labour under a certain amount of torticollis, from the second cause ; one of the muscles seeming either to have been inadequately developed, or somehow to have become partially paralyzed. Friction over the spine, and on the muscle which is weak—with care, on the part of the nurse, to manage so as to exercise the faulty muscle by position of the head, yet without fatiguing the extensors—usually suffices to effect a gradual but satisfactory amendment.

In a similar state of matters, in the adolescent or adult, the endermoid use of strychnine, or the electro-magnetic stimulus, may be had recourse to.

Spasm of the muscle may be either temporary or permanent. The former most frequently occurs in children ; and is to be treated by purgatives and alteratives, followed by anti-spasmodics internally ; locally by fomentation, leeching, and counter-irritation. Permanent spastic rigidity of the muscle is more common in the adolescent and adult ; perhaps a remote consequence of the former affection. Mercurial friction and active counter-irritation may be tried ; but with no sanguine hope of success. Sooner or later, tenotomy has to be employed ; and that not merely on account of the deformity, but to avoid a more serious evil—curvature of the spine—which often supervenes, and which may, if unchecked, become both extensive and confirmed. The needle is inserted obliquely,

at the origin of the muscle from the sternum and clavicle ; and division is effected by cutting either from without inwards, or in the opposite direction, as circumstances may seem to require ; great care being of course taken, not to injure the important parts which lie immediately behind that part of the muscle. To insure safety in this respect, it may be well, in some cases, to puncture with the ordinary tenotomy-needle or knife ; and then, withdrawing this, to substitute an instrument with a probe-point, wherewith to effect the section. Sometimes it may be sufficient to cut only one origin of the muscle ; but, usually, division of both heads is essential. By resilience of the severed extremities, restoration of the normal state of the neck is at once produced ; and this is maintained by suitable bandaging, if need be, until consolidation of the divided parts occur, with the due amount of elongation.

A similar operation is the only means whereby we may expect to cure the third form of the affection ; that proceeding from structural change by inflammation and its results.

Twisting of the neck is caused also by tumours—glandular and others ; and likewise by the contraction of extensive burns. The principles of treatment in these cases are obvious.

Wounds of the Throat.

Wounds of the throat are of two classes ; those inflicted by the hand of the suicide, or the murderer ; and those made by the surgeon. The former now engage our attention. They are usually made in a transverse direction ; and high in the neck—near or at the thyroid cartilage ; the latter circumstance being probably connected with the popular idea, that, to effect extinction of life, it is sufficient to open the air-passage, and so cause suffocation. The extent and consequent importance of such injuries vary very much ; from mere scratches, penetrating no deeper than the subcutaneous cellular tissue, to the most ghastly severing of all textures—almost to decapitation. Sometimes the incision is made immediately beneath the chin. Not unfrequently it is placed between the hyoid bone and thyroid cartilage ; the mouth being opened into, and the air-passage left intact. Sometimes the weapon is

drawn across, a little above the clavicle ; and then, if any considerable depth be attained to, death is certain and immediate. Sometimes the knife, held as a dagger, is plunged into the lower part of the neck ; to the imminent risk of the larger blood-vessels. But the region of the larynx is that which is most frequently injured.

The first danger is by hæmorrhage. If the carotid and jugular have been reached, death is very speedy, and may scarcely be prevented. Such extreme wounds, however, are of comparatively rare occurrence ; the vessels being protected, high in their course, by the depth of their situation in reference to the front of the neck, and by the density of the parts which have to be divided ere the sweep of the sharp edge can reach them. When, however, the deed is attempted, with a truer skill and deliberation, not by a horizontal gash, but by a puncture in the direction of the vessels, the escape of these is likely to prove rather the exception than the rule. A more limited transverse wound, leaving the carotid and jugular intact, may still cause death by hæmorrhage, directly, and within a very brief period ; by implication of the active thyroid vessels—arteries and veins. And again, a comparatively slight bleeding may prove fatal, more remotely ; the blood trickling into the larynx, and accumulating within the air-passage, so as to induce asphyxia ; such accumulation being permitted by the insensibility of the patient, or by his inability, through faintness, to make the requisite efforts for expectoration.

The second danger is by inflammatory changes at the wounded part ; occluding the laryngeal aperture or canal, or otherwise interfering with respiration. And this is all the more likely to occur, if the wound have been brought together tightly, with an imprudent haste. The mucous membrane, as well as the rest of the wound, becomes the seat of an acute inflammatory process ; and the consequent swelling may be such as to cause rapid and great occlusion. At the same time, mucous secretion is both increased in quantity, and vitiated in quality—becoming more viscid and tenacious. This, accumulating in the already narrowed canal, renders the suffocative hazard all the more imminent. And the risk is further contributed to, by the diminished power of expectoration which a patient so situated necessarily possesses.

A third danger, liable to occur along with, and to aggravate that which has just been considered, is—that, during the movements of the part—voluntary and involuntary—one portion of the wound is not unlikely to overlap the other, and thus, by suddenly producing a mechanical obstruction to the passage of air, at once to bring life into the greatest peril.

A fourth danger is by the occurrence of inflammatory action in the trachea and lungs; the inflammatory process either extending downwards from the wound, or the unwonted direct access of cold air proving an exciting cause of an original morbid action. Bronchitis, indeed, more or less severe, is almost an invariable consequence of such injuries.

A fifth danger arises from inanition, in those cases in which the gullet has suffered; and when, consequently, it is not easy to maintain a due supply of nourishment. Hectic, also, may ensue, in the case of an extensive, profusely suppurating, and slowly healing wound; more especially if much blood have been lost at the time of the infliction of the injury.

And lastly, the mental condition is, in all cases, likely to exert an untoward influence on the bodily frame. In not a few examples, when dissipation has led to the rash and guilty act, life is perilled at an early period by the occurrence of delirium tremens. Or this, indeed, may have been some time in progress, and may have caused the suicidal attempt. And in those cases which have been preceded by a gloomy, brooding despondency, a continuance of low mania, accompanied by typhoid symptoms, will usually paralyze our best remedial efforts, and determine a fatal issue by sinking.

Thus it can be readily understood, how few cases in Surgery present more obstacles to satisfactory treatment than do those of cut throat. We overpass one difficulty and danger only to meet another. And, too frequently, after the most prominent evils have been skilfully counteracted, the patient slowly yet surely sinks under obscure typhoid symptoms, intimately connected with mental alienation.

Treatment.—When called to a case of cut throat, it is obviously our first duty to arrest the hæmorrhage. And this is done by ligature of the arterial orifices; pressure being applied, if need be, to the venous points. Then the wound is to be approximated by suture; not wholly, but in part. The

angles are drawn and kept together ; but the centre and front of the wound is left free, and approximation there is effected solely by attention to position of the head—keeping the chin, by bandaging if necessary, depressed towards the sternum ; and even this is not done, until all bleeding from the wound has ceased. If the chasm be at once drawn tightly together, the immediate risk is greatly enhanced, as already stated ; and yet this is an error very frequently committed, in the hurry of actual practice. Blood, oozing from the cut parts, does not find a ready escape externally, but either trickles into the air-passage and accumulates stealthily there ; or is infiltrated into the parts around the line of wound, causing compression of the windpipe by the increasing coagulation ; in either way threatening suffocation. The viscid mucus, too, is more likely to entangle itself in the shut wound ; and inflammatory turgescence is more prone to prove untoward. Air, also, is likely to be infiltrated into the cellular tissue, during expiration ; causing troublesome and dangerous emphysema. When, on the contrary, the wound is left centrally free, these latter risks are not only less likely to occur ; but, also, in the event of their occurrence, their untoward tendency can be much more readily and effectually counteracted. It need scarcely be added that the dressing of the wound should be most simple ; consisting, not of a complication of plaster, compress, and bandaging—but of a mere strip of lint, moistened in water, and loosely and lightly retained upon the part.

The main bleeding having been secured, and the wound partially approximated, the patient is laid on his side so as to favour outward escape of the continued oozing. And the cut part is protected from unfavourable atmospheric impression, by a covering of loose gauze, or of woollen texture, thrown lightly over the neck ; attention being at the same time paid to maintain an equable and genial temperature in the apartment. Duly qualified attendants are by, not only to guard against repetition of the suicidal attempt, but also to be prepared to separate and clear the wound, should swelling and entanglement of mucus render such a proceeding necessary to prevent suffocation. And the patient should be instructed to facilitate his expectoration, by completely shut-

ting, or very much diminishing, the wound, by means of his fingers, at the time of the effort being made. It is hoped that the wound will inflame, granulate, contract, and cicatrize, in the ordinary way; and the local treatment is conducted with that object in view. Constitutionally, we have to guard against favouring inflammatory action in the wound, and in the air-passages, by neglect of antiphlogistic measures; and, on the other hand, we must beware of aggravating, by want of support, the tendency to sinking which sooner or later becomes apparent in the majority of cases. As a general rule, blood-letting from the system is seldom if ever warrantable.

Should the pharynx or œsophagus have been wounded, the use of a tube becomes necessary, in order to convey nourishment to the stomach. In the ordinary effort of deglutition, the ingesta would necessarily escape more or less copiously by the wound, and so do harm in many ways. The feeding tube cannot be inserted from the wound—although the facility of such a proceeding may invite the attempt—otherwise closure of the wound must be most seriously interfered with. If intended to be introduced and worn permanently, until the pharyngeal or œsophageal wound shall have closed, it is to be passed by the nostril. But it is found to be more expedient to introduce the tube only occasionally, by the mouth; twice or thrice daily, as circumstances may seem to require. It is not necessary to pass the instrument completely down to the stomach; it is enough that its extremity is placed fairly beyond the wound. And, of course, the precaution is not neglected of ascertaining that the lodgement is rightly accomplished, ere the fluid nourishment is begun to be injected. One very obvious objection to the permanent retention of a tube, whether passed by the mouth or by the nose, is, that the distal extremity, pressing against the posterior part of the windpipe, is apt to occasion ulceration there, which may perforate; complicating the case untowardly, by the establishment of tracheal fistula. Should this occur—as has happened—the ordinary test of the tube's being rightly placed will probably fail; the air, in expiration, escaping by the tube in the œsophagus, as well as by the natural outlet.

Throughout the whole cure, the state of respiration must be sedulously watched. And should threatening of suffoca-

tion supervene—as is not unlikely—and prove of such a nature as not to be removed by attention to the state of the wound, tracheotomy is to be had recourse to unhesitatingly. And then, the canula being retained in the tracheal wound, the transverse aperture is brought together, and treated so as to favour rapid union—there being no longer any risk from internal swelling or other change at that site.

I have often thought, that in extensive transverse wounds of the neck, implicating the windpipe, however inflicted, tracheotomy may be regarded as expedient at an earlier period; that is, shortly after arrest of the hæmorrhage, and partial approximation of the wound; so soon, in fact, as the patient has rallied sufficiently to bear the immediate effects of the operation. For then, we would have it in our power to place and maintain the whole track of the wound in perfect apposition, and perhaps to obtain union almost by the first intention. So soon as the chasm had fairly closed, then the canula would be withdrawn, and the tracheal opening cautiously and gradually closed. And thus, also, would we be more likely to avoid the occurrence of a troublesome fistulous tendency in the suicidal wound; which, in the ordinary progress of cure, not unfrequently threatens to be, or is established. In performing the operation, it will be expedient to raise and steady the windpipe, by means of a hook fixed in the lower margin of the transverse wound.

In those cases which recover, there is a risk of the larynx becoming contracted in its calibre, so as seriously to interfere with normal respiration; and all the more probably, if there be at the same time a fistulous opening established by imperfect closure of the wound. Such cases are doubtless unpromising; yet are capable of being brought to a prosperous issue. The contracted passage may be dilated by bougies passed from the mouth; and, the normal capacity of the larynx having been restored, the fistulous opening may be made raw, and approximated by suture. A successful case of this nature occurred in the practice of Mr. Liston.*

* LISTON'S *Elements*, p. 435.

Bronchotomy.

Under this general term are comprehended the surgical wounds of the throat—Laryngotomy and Tracheotomy; made in a longitudinal direction; artificially opening the windpipe, with some important remedial object in view. But before treating of these operations, it may be well to consider briefly the various circumstances which may demand their performance.

Foreign Bodies in the Windpipe.

Foreign bodies, held in the mouth, are apt to pass into the windpipe, during sudden inspiration—as in speaking, crying, or laughing. During inspiration, the glottis is opened wide, and a foreign substance, even of considerable size, may pass readily inwards. For expiration, however, a comparatively narrow opening of the rima suffices; an aperture quite insufficient for the backward escape of the intruding substance; and, indeed, such escape is still further opposed by the effort to produce it, which, impinging the foreign substance on the tracheal aspect of the rima, stimulates that part to a spasmodic contraction.

The foreign substance may remain loose within the windpipe; moving from part to part, according to the circumstances of displacement. Or it may become lodged at a particular site: 1. In the larynx; becoming entangled in the ventricles; or being of such form and size as to be impacted in the general cavity. 2. It may be similarly fixed across the trachea; pins, portions of glass, and other sharp substances, for example, have been thus impacted. 3. In either bronchus. And the right being the more directly continuous with the trachea, in that the impaction is most likely to occur. 4. Or the body, of small size, may gravitate still lower, and take up a lodgement in one or other of the bronchiæ. 5. Or it may be impacted in the very rima glottidis. Thus:—a man, much intoxicated, becomes almost insensible, and is sick. The contents of the stomach are lazily evacuated upwards; and a portion of the ingesta may enter the rima and remain there, causing instant suffocation. A piece of potato-skin has thus proved fatal. Or, again, large sub-

stances, held in the mouth, and forced downwards in sudden inspiration, may prove too bulky to pass through the rima, and become impacted there; inevitably causing suffocation, unless instant relief be obtained, either at the hand of Surgery, or by the patient's own expulsive efforts. And, in such a case, it is consolatory to reflect, that, unless the tightness of impaction be great, success is more likely to follow the instinctive expulsive efforts, than in the case of smaller bodies within the larynx; spasm of the glottis being mechanically prevented, and consequently proving no obstruction.

The symptoms denoting the occurrence of such accidents are, in general, tolerably distinct. If impaction have taken place in the rima, the symptoms are those of rapid asphyxia; the patient suddenly exhibiting the greatest distress, becoming livid and swollen in the countenance, staring with bursting eyeballs, gasping anxiously, struggling for breath, and speedily becoming insensible. When the foreign body has passed within the rima, the symptoms vary according to the site and nature of the lodgement; but, in all cases, they evince two leading characteristics—denoting obstruction to respiration, and irritation produced in the part with which the substance is in contact. If it be loose in the windpipe, or lodged in the larynx or upper part of the trachea, the following are the ordinary symptoms. A violent fit of suffocative cough immediately succeeds the entrance of the foreign body—seeming to cease, it is probable, only on Nature having been wholly exhausted by the prolonged and violent effort. And, at short intervals, such paroxysms are renewed; more particularly if any new movement of the foreign body have occurred. The respiration is loud, strained, and of a hard, croupy, or sawing sound. The voice is changed. Pain is complained of in the part. A more or less copious discharge of mucus takes place, by expectoration; and sometimes of blood. The countenance is suffused, and expressive of great anxiety—an expression almost idiopathic, especially in the young. And the neck is stretched, with the head elevated and thrown back, in the position of orthopnoea. Often, all the auxiliary muscles of respiration are found in full play. It is right to remember, however, that in some cases—more especially when a considerable period has elapsed since the occurrence of the

accident—the intervals between the paroxysms may be passed in comparative quiet, with an almost total deficiency of symptoms at that time. When impaction has taken place in a bronchus, a characteristic sign is indicated by auscultation—dulness of the lung on that side, with puerile respiration in the opposite organ. Or a still more plain indication may be afforded, if the substance happen to be of musical capability, however rude, and so situated that the air passing by it in respiration may evoke its powers of sound. Sometimes, the foreign body, when loose, may be felt distinctly impinging against the upper part of the larynx, during a convulsive effort at extrusion.

The affection with which this accident is most apt to be confounded, is the rapid obstruction of the upper part of the windpipe by inflammatory action. But the history of the two cases must necessarily be very prominently different; the urgent symptoms being in the one case immediate, unaccompanied with febrile excitement of the system, and often most intense at first; while in the other they are more or less gradual in their accession, of a crescent character, and invariably attended with inflammatory fever. Also, in the accident, expiration is difficult, while inspiration is comparatively easy; whereas, in the disease, the precisely opposite condition obtains.

That in all cases there is a necessity for the speedy adoption of measures calculated to effect removal of the foreign body, is tolerably plain. Otherwise, the risks to life will be neither few nor slight. 1. Sudden suffocation may occur, at a very early period, by impaction of the substance in the upper part of the larynx—as already shown. 2. Imperfect respiration may more gradually induce a fatal issue; in consequence of the partial obstruction caused by the foreign body, and the probable accumulation of mucus at the incommoded part. 3. Laryngitis or tracheitis may be excited, of formidable character. 4. Congestion may take place in the lungs; followed perhaps by an apoplectic disruption of the pulmonary tissue, or by pneumonia, or by bronchitis. 5. A foreign body of small size may perforate a bronchus or bronchial tube, and lodge in the pulmonary tissue; and acting untowardly there, as all foreign substances must, may cause

abscess, or lay the foundation for tubercular deposit and fatal phthisis. 6. Or the passage outwards may be more advanced. The lungs may be passed through, and the cavity of the pleura reached; and empyema may be the result. No doubt, it has happened, that yet another step has been taken; the foreign substance has perforated the walls of the chest, by tedious ulceration, and been discharged externally. And it has also happened, that a foreign body has been expectorated by the mouth, along with purulent matter, at a long date from its introduction. But such occurrences are much too rare, to warrant their use as precedents, in determining the appropriate treatment.

If the violent natural efforts of the patient fail to dislodge and extrude the foreign body—as is not unlikely—as a general rule, recourse must be had to bronchotomy; and through the artificial opening in the windpipe, the foreign body is sought to be extracted. Before proceeding to this operation, however, it is well in some cases of comparative obscurity, to explore the pharynx and gullet, in the first instance. Urgent symptoms of dyspnoea, we have already seen, may be caused by foreign substances lodged in either of these passages; thence compressing, irritating, and obstructing the air passage. And experience has shown that a foreign body, not bulky enough to cause dangerous compression, may lodge near the rima, and exterior to it; may cause many of the ordinary symptoms of a foreign body within the windpipe; and that in such a case, while bronchotomy must necessarily fail, expulsive efforts, duly aided by the surgeon, are most likely to succeed.*

When the foreign body is of small size, and plainly indicated by the symptoms to be either loose in the air passage, or fixed in the upper part of the larynx, laryngotomy may be had recourse to. It is of easy performance; and, though the aperture through the crico-thyroid space be necessarily of limited dimensions, it is probable that through that space such a foreign body may be readily enough removed. In all other cases, however, tracheotomy, though a more troublesome operation, is for obvious reasons to be preferred; the

* *Lancet*, 1869, p. 729.

aperture is more free, and the facilities for extraction, both from below and from above the opening, are manifestly greater.

When the foreign substance is loose, it is usually expelled, forcibly, by the outward current of air, so soon as the operation is completed. But if fixed, it must be sought for, and removed artificially. If lodged above the opening, in the larynx, a common probe is the most convenient instrument for exploration. By it the site is detected ; by it the foreign body may be pushed through the rima—to be coughed up ; or by it loosening is effected, with subsequent expulsion through the tracheal wound. When the site of lodgement is in the bronchus, the long curved forceps—such as recommended for extraction of foreign matter from the pharynx and œsophagus—are very suitable both for exploration and for extraction. Auscultation and percussion having previously imparted to the operator a shrewd suspicion of the site of lodgement, the instrument is passed down shut, and made if possible to impinge on the foreign substance ; then, slightly withdrawn, the blades are opened ; and, pushing on again gently, the intruder is probably grasped ; if not, the other forceps—opening in an opposite direction—is similarly employed, with almost a certainty of success. The wound is kept open, until bleeding has entirely ceased ; it is then brought accurately together by adhesive plaster, and adhesion hoped for.

But the air passage may prove intolerant of the presence of the forceps ; and perseverance in their use, searching for a foreign body, might peril life by violent paroxysms of dyspnoea. In such cases, modern experience has pointed out a safer mode of procedure*—more especially if the foreign body be of some weight, as a stone, coin, or any piece of metal. The tracheal wound being kept open, let the patient's body be inverted, so as to make the head dependent ; and, if need be, let succussion of the frame be had recourse to, so as to favour dislodgement of the offending substance, and its descent towards the larynx by gravitation. Arrived at the rima, it will not find its outward passage there obstructed by

* *Lancet*, 1063, p. 502.

spasm, nor will a paroxysm of dyspnœa be induced ; for, the opening in the trachea has the effect of obviating this difficulty and danger. Escape is made readily into the mouth, and thus extrusion is effected with both ease and safety.

It has been proposed to supersede bronchotomy altogether, by the preceding manœuvre. But such a proposal does not seem to be a prudent one. In most cases, the attempt would probably fail, and life be imminently perilled, the foreign body being obstructed by spasm at the rima, and perhaps becoming impacted there. The proceeding can be followed, in safety, only when a tracheal aperture has previously been established ; and when, in consequence, irritability of the rima has been assuaged, and accident by impaction there fully provided against. A case or two of accidental success* will not suffice to overthrow the general principle here inculcated.

It may happen that some considerable time—weeks or months—has elapsed since the introduction of the foreign body, before aid is requested. Such lapse of time need not deter the surgeon from operating, if other circumstances prove favourable. For experience has shown, that removal of the offending matter, even at a distant date, may be sufficient to avert all serious ulterior consequences.†

Asphyxia.

In attempting resuscitation from asphyxia, it is necessary to maintain artificial respiration ; and this is effected, in ordinary cases, by insufflation of air, through the mouth or nostrils. But were the rima glottidis to be spasmodically closed, such ordinary means would be likely to inflate the stomach only, leaving the lungs unaffected. Under such circumstances, therefore, one of two proceedings is necessary ; to pass a tube into the windpipe from the mouth ; or to perform bronchotomy—and it is probable that laryngotomy may generally suffice. The operation of passing a tracheal tube is always difficult ; and becomes especially so, even in an insensible

* *Northern Journal*, Feb. 1845, p. 220.

† *London and Edinburgh Medical Journal*, August 1842, p. 722 ; and LISTON'S *Practical Surgery*, p. 371.

patient, if the rima be closely shut—as in the case of suffocation by carbonic acid. It can readily be understood, therefore, how in many cases such procedure is well superseded by bronchotomy. One caution must be particularly attended to ; namely, to prevent blood from entering by the wound, and accumulating in the air passages. And should such entrance have been effected, means should be taken, by suction applied to the wound, to accomplish its expulsion.

In cases of *Suspension* by the neck, it is plain that the performance of bronchotomy cannot avert a serious result, and may probably fail in the attempt at resuscitation. For, the cause of death is not from constriction of the windpipe only ; but by concussion of the brain and spinal cord, and by interference with the jugular circulation—perhaps causing apoplexy. And these latter circumstances may of themselves be sufficient to produce a fatal issue, independently of direct interference with respiration. Seldom does any displacement occur in the cervical vertebræ.

Bruise of the Larynx.

A blow sustained on the larynx may directly peril life by arresting respiration. The rima glottidis may be wholly shut, either by spasm of the occluding muscles, or by paralysis of their antagonists—more probably by paralysis of all the muscles concerned ; or it may be but partially occluded, yet with such a tumult and difficulty of respiration as to render the case one of great and immediate hazard. And, under such circumstances, it is plain that the only prospect of relief is by tracheotomy—opening the windpipe below the paralyzed part ; the aperture being kept patulous, until the parts have recovered, and are able to resume their wonted functions in normal respiration.

Rupture of the trachea, by external injury, may prove fatal, by rapid and extensive emphysema ; the pressure of this producing asphyxia more or less rapidly. By making many and early punctures in the affected part—or by incision—we may give an outward escape to the air, and so avert the threatened disaster.

The Accidental Swallowing of Boiling Water, Acids, or other Irritant Fluids.

It is common, among the poorer classes, to have but one vessel—a large kettle—to hold water for culinary purposes—sometimes cold, at other times hot, according to circumstances. A child, accustomed to have its thirst assuaged from such a source, is likely to help itself, when no one else is near ; and, in doing so, may unhappily fill its mouth with fluid of a boiling temperature. Instantly an attempt is made by the little sufferer, to eject the fluid ; and in the backward movement of the hot water, partial entrance into the open rima glottidis is not unlikely to occur, during the expulsive paroxysm. The result is a scalding of the air passage, as well as of the pharynx and upper part of the œsophagus ; and by swelling, during the subsequent inflammatory process, in the former situation, the most serious results may ensue.

Adults may swallow acids or other acrid fluids, either by accident, or intentionally. In the latter case, the air passage is seldom injured. The determination to the act of swallowing shuts the glottis, and the fluid passes downwards in the gullet alone. But if a patient accidentally attempt to swallow a fluid of this kind, mistaking it for some other of a harmless nature, the expulsive effort is instantly made—as in the case of the child with hot water ; the glottis is opened in the paroxysm, and the noxious fluid effects a partial entrance there.

The treatment of such cases requires to be conducted with an energy proportioned to the urgency of their nature. The inflammatory process may not be prevented ; but it should be our anxious endeavour to moderate and delay its onset, and to effect its speedy retrocession. The most active antiphlogistics are employed—immediately ; bleeding from both part and system ; outward fomentation ; calomel and opium. It may be that by such means the progress of inflammatory tumescence may be restrained, so as not to affect respiration urgently, and that extension of the inflammatory action from the parts first involved to the air passages in general may be prevented. If, however, antiphlogistics fail, and asphyxia

threaten by obstruction in the larynx, tracheotomy is to be had recourse to ; at once ; not reserving the operation, especially in the child, until by extreme urgency of the symptoms it cannot possibly be any longer delayed, and when recovery is rendered more than problematical by the occurrence of congestion in the brain, in the lungs, or in both. Laryngotomy is plainly unsuitable ; to practise that, would be to cut into the affected part, and to fulfil very imperfectly, if at all, the object of the operation. The wound of tracheotomy, on the other hand, is below the seat of disease, the affected part is put at rest, life is saved from asphyxia, and the inflaming larynx, by being allowed quietude, is powerfully aided in the resolatory effort. On decadence of the inflammatory process, and when absorption, clearing away all swelling, has restored the normal state of the larynx, the wound is permitted to close ; the tube is withdrawn, and the margins are approximated by plaster.

Spasm of the Glottis.

It has been already stated how bronchotomy may be highly available in the case of spasmodic closure of the glottis, threatening asphyxia ; as in poisoning by carbonic acid.

Laryngismus Stridulus, a spasmodic affection of the windpipe, not uncommon in children, and occasionally met with in the adult, may in its paroxysms threaten suffocation ; and, in such circumstances, the question of the expediency of bronchotomy comes to be entertained. In general, the operation is to be withheld, unless the circumstances prove extremely urgent ; and it is then employed as a means of palliation and protraction, not of cure. And more especially will the prognosis be guarded and unfavourable, if there be reason to believe that the spasmodic attacks are dependent on irritation produced by structural change at a low part of the windpipe ; as by enlargement of the thymus gland, affection of the bronchial glands, aneurism, or other formation of tumour.

It were out of place, in such a work as this, to enter at all fully into the various interesting and important affections of

the windpipe. They will be noticed briefly, in connexion with the operation of bronchotomy ; the leading features only being stated.



Laryngitis.

The inflammatory process, occurring in the larynx, may be either chronic or acute.

I. ACUTE LARYNGITIS. *a. Laryngitis simplex.*—There is, in this affection, more or less turgescence of the mucous membrane, with the accustomed change of secretion—the results of a minor amount of the inflammatory process ; but the swelling is diffused uniformly—is not at any part great—and the secretion is not liable to be retained and accumulated ; no paroxysm of dyspnœa threatening suffocation is likely to be caused by such changes ; and, consequently, in this affection the direct interference of surgery, by bronchotomy, is not required.

b. Laryngitis Œdematosa.—This is the acute *Œdema Glottidis* ; an inflammatory process attacking the larynx, and rapidly causing much bulging of the lining membrane by serous and fibrinous infiltration of the submucous tissue ; active congestion being rapidly reached, and persisting of high intensity. In consequence of such change, the characteristic symptoms are soon developed ; increasing dyspnœa, liable to paroxysmal exacerbation ; inspiration protracted, laboured, sibilant ; expiration comparatively easy and silent ; anxiety of countenance, &c. And, besides, there is ultimately afforded to the surgeon a more plain indication ; inasmuch as the œdematous swelling may be felt, on the epiglottis and glottis, by the finger introduced from the mouth. Practically, the disease may be divided into three stages. 1. There is the condition of laryngitis simplex ; while the action has not proceeded beyond turgescence, and when there is no obstruction to breathing. But this state is quickly overpassed, in most cases. 2. The characteristic œdematous swelling is forming ; not diffused and uniform, but mainly affecting the glottis and its immediate neighbourhood, and causing prominent bulging there. Respiration is now more or less impeded ; and the obstruction is on the increase. 3. Breathing having been for

some time seriously interfered with, and aëration of the blood imperfectly performed, untoward results begin to manifest themselves in both lungs and brain—congestion, followed by serous effusion ; the threatening of asphyxia is aggravated by threatened supervention of coma. Most frequently the obvious cause of death is by the former event ; for, the obstruction by mucous swelling becoming greatly augmented by accumulation of viscid mucous secretion, a paroxysm of dyspnœa is induced ; in the tumultuous disorder of respiration that ensues, it is not improbable that the patient may drop asphyxiated ; and recovery from that state will plainly be seriously affected by the cerebral change already in progress. In other cases, the fatal issue is more gradual ; the asphyxia steadily advancing, without paroxysmal aggravation.

The suitable treatment is active throughout. At first, the ordinary antiphlogistics are plied industriously ; blood-letting, antimony, calomel and opium. These may arrest the affection in its first stage. If not, let them be persevered with ; for they may yet mitigate the swelling, prevent the occurrence of urgent symptoms, and procure a favourable resolution from the second or characteristic stage, without life having been ever seriously endangered by threatened asphyxia. In this stage, however, be it remembered, that blood-letting must be had recourse to with very considerable caution ; it being well known, from experience, that there is an intolerance of this remedy, heroically employed, in all cases in which respiration is seriously obstructed. Let mercury take the place of loss of blood ; and by it, judiciously employed, let us hope to limit deposit and promote absorption successfully, and thus to make a satisfactory impression on the œdematous bulging. Should, however, resolution fail to follow on the use of such means—the symptoms proving both crescent and grave—let bronchotomy be at once had recourse to ; regarding the operation as truly a part of the remedial treatment, whereby the peril of extreme urgency may be avoided, not as a last resource whereby a life half lost may only perhaps be regained. Tracheotomy is plainly to be preferred ; for thus only can we place the artificial opening beneath the seat of obstruction, so as to effectually avert the immediate danger by impending

asphyxia ; and thus only can we fulfil the very important indication of placing the affected part in the state of comparative quietude and repose, so suited for facilitating resolution and recovery. The medical treatment is not interrupted meanwhile. In due time it tells favourably on the swelling. This begins to subside ; and then the use of the tube may be begun to be discontinued. Ultimately the part recovers itself wholly, as to swelling ; and then, the tube having been finally withdrawn, the wound is approximated and encouraged to heal. During the first hours of the tube's use, great care is necessary in keeping the aperture clear ; viscid mucus is being copiously secreted ; the power of expectoration being very weak, occlusion of the artificial rima is very apt to ensue ; and such risk by sudden asphyxia is all the more likely to occur, if the patient have fallen asleep shortly after performance of the operation—as often happens. More than one day and night may have been passed in sleepless anxiety, pain, and distress ; and the relief at once experienced, after the first effects of the tube's introduction have passed away, is apt to lull the relieved sufferer into a deep and unconscious slumber—from which it were surely hard to be awakened, abruptly, only to perish by suffocation. The attention of a qualified attendant must be constant, to maintain clearance of the tube, until the excessive secretion of mucus has diminished, and the power of expectoration been regained.

In this affection, then, let tracheotomy be had recourse to, so soon as it is plain that medical treatment has failed to effect timeous resolution. Do not delay, until both lungs and brain have been so far involved, as to render recovery under any treatment at that stage more than doubtful.

c. Laryngitis Fibrinosa is usually combined with a corresponding morbid state of the trachea—tracheitis fibrinosa—constituting *Croup*. This, too, may be conveniently divided into three stages. 1. Again the laryngitis simplex, but of greater intensity than in the previous case, and with a marked tendency to spread along the mucous membrane downwards. 2. The fibrinous exudation is begun ; aggravating all the symptoms, and affording serious obstruction to breathing. 3. The lungs and brain are implicated, as in the former case, by reason of the continuance of impeded respiration. The former

organs, however, in this case are exposed to an additional source of danger. The inflammatory action, by continuous extension, may have reached the bronchial ramifications ; and to the oppression of the lungs' play, otherwise occasioned, the additional and serious complication of bronchitis may be added.

In the first stage, medical treatment is practised, as in the corresponding period of the previous affection. There is no demand for bronchotomy, on account of urgency of symptoms connected with respiration ; and the spreading acute inflammatory action is not likely to be limited, in either its extent or intensity, by the infliction of a tracheal wound, and retention of a foreign body therein. In the second stage, the symptoms are sufficiently urgent to call for any aid which our art can afford. Tracheotomy will give a more direct and free entrance for air passing towards the lungs, than through the affected larynx ; and the larynx will be placed in a state of comparative rest, favourable to recovery. But the same good result does not follow, as in the case of acute *œdema glottidis*. The disease is not limited to the larynx, but has passed the site of tracheal wound, and is already securely established, too probably, in the bronchial tubes ; the wound is made, not in a comparatively sound part, to afford rest to the superior portion of the canal—but in the midst of the disease, affording rest to but a part, and a minor part, of the disorder's seat, and inducing, by its additional stimulus, an aggravation of the whole. Air is let in towards the lungs, but with only a doubtful chance of reaching them ; for by this time the bronchial tubes are clogged with viscid mucus, the bronchial membrane is itself swollen and infiltrated, the trachea is more or less obstructed by false membrane, and perhaps, indeed, pseudo-membranous exudation has extended throughout almost the whole bronchial ramifications. Thus, the salutary indications are not fulfilled, and the operation fails of its expected issue. In the third stage, surgical interference must prove still more manifestly hopeless. In this disease, therefore, the practical inference from such considerations will be, that our principal confidence must be placed in medical treatment ; that the operation of tracheotomy—laryngotomy being in all respects obviously unsuitable—cannot be

expected to prove of service, and had better not be performed; and that if the operation be had recourse to, it should be during the second stage, when it has become evident that medical treatment has failed to arrest or mitigate—and before the third stage has set in, rendering recovery under any circumstances all but absolutely hopeless. Recourse to the operation may be safely regarded, therefore, as the exception rather than the general rule.*

But there are cases of *true* laryngitis fibrinosa, in which the action is mainly limited, and the pseudo-membranous exudation entirely confined, to the larynx itself. These are few certainly, compared with the ordinary examples of croup; still they do occur; and may be diagnosed by the absence of tracheal and pulmonary symptoms, and by the apparent concentration of laryngeal disorder. In such cases, if medical treatment fail in the second stage, and symptoms are urgent, tracheotomy should be unhesitatingly practised, on precisely the same grounds as in acute cedema—and probably with the same fortunate result.

Diphtherite, or *Cynanche membranacea*, may be said to be a variety of laryngitis fibrinosa. But the aphthous exudation, and the action which causes it, do not originate in the larynx, but in the mouth and fauces, thence spreading rapidly downwards. The lungs, through the bronchial ramifications, are early involved, and cannot possibly be relieved by a tracheal wound. Bronchotomy is in this affection inadmissible.

d. Laryngitis Purulenta.†—In this, the inflammatory process is of a more intense character than in any of the preceding forms of acute laryngitis; true inflammation is reached, and its characteristic product exhibited. Fortunately it is of comparatively rare occurrence; and the action is usually con-

* I am quite aware that authority is not wanting to enforce an opposite practice; Trousseau and Bretonneau, for example, warmly advocating the performance of tracheotomy in croup, and supporting their doctrine by an array of successful cases, (*Brit. and For. Rev.* No. 23, p. 110.) But, on this point, the question always obtrudes itself;—Were these cases all examples of true croup? For it is well known how loosely surgical nomenclature is often applied; and as, by some, all sores on the penis are called chancres, all hard swellings of the breast dignified by the appellation of scirrhus, every bleeding fungus called fungus hæmatodes—so may all acute affections of the larynx be arranged under the general denomination of croup.

† *London Medical Gazette*, January 12, 1833.

finer to the upper part of the larynx, and corresponding portion of the fauces. The matter is not limited in the form of abscess, but is diffusely infiltrated into the submucous cellular tissue. The membrane gives way, the matter is discharged, and an ulcerated surface remains. The symptoms and progress are very similar to those of acute oedema. And the treatment is to be guided by precisely the same principles. By medical treatment we hope to arrest the action, in time to avert peril to life. If not, and dyspnoea increase threateningly, tracheotomy is to be performed, early, in the second stage, as a *part* of the remedial treatment. The prognosis is favourable—as in oedema, timeously relieved.

Acute ulceration of the larynx may result from this affection, as already stated; almost certain to be attended with more or less oedema; and consequently requiring the same surgical aid as the acute oedema glottidis.

II. CHRONIC LARYNGITIS.—This may be the result of an acute or subacute attack; more frequently it is chronic from the first. But, however originating, it is ever liable to sudden acute or subacute aggravation, from comparatively slight causes; bringing life into peril,—all the more imminently, on account of the insidious and comparatively mild nature of the previous symptoms.

a. Thickening of the Mucous Membrane, resulting from what may be termed Simple Chronic Laryngitis, usually gives way to remedial treatment alone; leeches, counter-irritation; mercury, and other alteratives. Should an acute accession supervene—and to such the patient is constantly liable—obstruction to respiration may be speedily induced, threatening the most serious consequences. Under such circumstances, proportional augmentation of the medical treatment may fail to relieve; and then tracheotomy comes to be required. Its effect is not only to avert the immediate danger to life; but also, by placing the affected larynx in a condition of comparative repose, to afford great aid to the continued medical treatment in finally overcoming the original disorder.

As a general rule, when counter-irritation is employed in any affection of the larynx, it should be applied either laterally, or on the back of the neck, not in front. For, the remedial effect is the same; and it is obviously expedient to

leave the site of tracheotomy clear and available, in the event of a recourse to that operation becoming necessary.

b. Chronic Œdema Glottidis.—This affection is more gradual and less marked than the acute form; but is proportionally more dangerous; being liable to sudden and great exacerbation. The œdema is gradually formed, of a more solid consistence, and more uniformly diffused. But, from slight exposure to cold, error in diet, or other casualty, acute accession is very prone to be engrafted on the chronic structural change; speedily—almost suddenly—blocking up the passage, and causing the most distressing and dangerous dyspnœa; partly by acute swelling, partly by entanglement of viscid mucus, partly by spasmodic or otherwise disordered action of the muscles of the larynx. Sometimes, without any apparent source of aggravation, a fit of dyspnœa suddenly occurs; dependent, probably, on the last mentioned cause—spasm. Such a patient is never secure. One moment he may be walking abroad, conversing, or otherwise enjoying life with tolerable comfort; the next he may be prostrate, livid, and struggling for existence. A fatal result, however, seldom follows the first of such seizures. Minor attacks usually precede the fatal event.

The duty of the practitioner is, by suitable medical treatment, to arrest the minor and sluggish action, to undo the change of structure, and to restore tone to the enfeebled system; and, by every care, to provide against the application of such causes as are likely to induce aggravation. Should such aggravation occur, he must be on the alert. Medical treatment is continued, with a redoubled care and anxiety; and the patient is closely watched. And if the treatment prove unsatisfactory—fits of dyspnœa continuing to recur—tracheotomy is certainly to be performed. Thus only can the tenure of life be rendered at all secure in such cases. Then the other remedial means may be expected to have a more salutary effect on the original disease—as in the case of simple thickening; and, after some time, the tube may be withdrawn, and the wound closed. However, the prognosis as to discontinuance of the tube is not so favourable as in the acute form. Resolution may be slow and imperfect; the part may never wholly regain its normal state; perhaps respiration can-

not be restored through the normal passages ; and the tube, consequently, may require to be worn during the remainder of life.

c. Ulceration of the Larynx.—The larynx is liable to ulceration of different kinds—the result usually of a chronic inflammatory process. 1. *Simple ulceration* may occur as a direct result of chronic laryngitis ; or the larynx may be implicated secondarily, by extension of ulceration from the fauces—as is not unlikely to happen in patients who have the misfortune to labour under an aggravated form of mercurio-syphilis. The ulceration is very liable to be surrounded by an œdematous swelling, which, by obstructing respiration, seriously aggravates the case, and may demand both instant and energetic measures to save life. And such complication is especially apt to occur, if by exposure, or other cause, an inflammatory aggravation have supervened on the previously chronic action. Or the amount of œdema may be slight, respiration may never be seriously impeded, the ulcer may heal, and the normal calibre and function of the larynx may be almost wholly restored. Or, on cicatrization—long delayed—being ultimately completed, contraction and displacement of the parts are such as permanently to interfere most seriously with both voice and respiration.

The treatment consists in constitutional alteratives, suitable regimen, careful protection from all sources of aggravation, and patient continuance of moderate counter-irritation ; and thus we hope to effect cicatrization, ere dangerous loss of substance has occurred—to effect, in short, something like actual resolution. If œdema supervene, and life be threatened, by paroxysmal dyspnœa, tracheotomy is imperatively demanded, and must be performed. At this juncture, it is indispensable to the preservation of life. But it comes to be a question, whether its earlier employment may not be expedient ; not to save life, directly, but to save structure ; by placing the larynx at rest, to facilitate the action of the ordinary remedial means—accelerating cicatrization while ulceration is yet both limited and superficial, and thus preserving unimpaired the important function of the organ. I would incline to the opinion that it is expedient to have recourse to tracheotomy, and the temporary use of the tube, in those

cases of simple ulcer of the larynx which threaten to resist the ordinary remedial means, and which, by loss of substance, endanger the function of the part; operating before life has been threatened by intercurrent œdema; when there is soreness on pressure of the thyroid cartilage; when pain is complained of, as acute, on the box of the larynx being rubbed laterally across the spine; when there is a sensation of rawness and soreness in the part complained of by the patient; when there is a decided and peculiar foetor in the breath, with pain and difficulty in swallowing, cough, and purulent sputa—occasionally streaked with blood; and when these symptoms persist unsubdued under the ordinary treatment. The diseased part is put at rest; the counter-irritation and alterative treatment will have a much more powerful and salutary influence; and besides, an opportunity is afforded of applying remedial means directly to the ulcerated surface. From the tracheal wound, a bent probe, carrying lint soaked in a solution of nitrate of silver, may be carried upwards and applied freely to the diseased surface; and repetition may be made, as circumstances seem to require. Thus, healing may be attained at an earlier period than otherwise could have been possible; the part recovers without loss of substance; and, after a time, the tube may be finally withdrawn, leaving the cure complete. When, however, tracheotomy has been performed at an advanced period of the case, on account of emergency caused by œdema, the time of the tube's discontinuance is very uncertain; a falling in of the box of the larynx is too probable, as a result of cicatrization; and, in consequence, permanency of the artificial opening may be rendered indispensable.

2. *Tubercular Ulceration* not unfrequently attacks the wind-pipe; constituting the true *Phthisis Laryngea*. There is first submucous or mucous deposit of tubercle, which softens, disintegrates, and opens up the membrane in patchy chronic ulceration. The scrofulous cachexy attends; and too frequently, also, the more formidable affection of phthisis pulmonalis is co-existent. By no means are we likely to make a satisfactory impression on such a constitutional malady. The ordinary treatment, however, is to be patiently, though scarce hopefully, employed. Tracheotomy is certainly not advisable, as

a means whereby cicatrization and cure may be effected ; but it may be had recourse to as a mere palliative—a means of protracting existence—when, by the occurrence of œdema, life is threatened from suffocation.

3. *A diseased state of the cartilage* is not unfrequent, in broken down mercurio-syphilitic habits ; associated with chronic abscess and ulceration. In advanced age, the cartilages become ossified, and may necrose. But this which we now allude to is a different affection ; bearing the same analogy to senile degeneration, as the atheromatous deposit in the arterial tissue, favourable to aneurism, does to the senile calcareous condition of arteries. The cartilage is thickened, indurated, changed in hue, and partially ossified ; portions die ; suppuration takes place around ; the matter bursts into the windpipe, and is expectorated ; a ragged ulcerated aperture remains ; the diseased portion of cartilage loosens, protrudes, and, having been wholly detached, is expectorated ; the cavity which held it may then contract and close, along with the ulcerated aperture through which it made its escape ; or additional suppuration takes place, fresh portions become necrosed, and the disease is both aggravated and protracted. In the most favourable point of view, prognosis is unsatisfactory ; for cicatrization cannot take place, without entailing such contraction and change of the canal as must seriously and permanently interfere with respiration. The treatment is as in ordinary ulceration of this part, with especial attention to the constitutional vice. And when an emergency, perilling life, does occur, by intercurrent œdema of the larynx, tracheotomy is certainly advisable ; not with the hope of thorough cure, but in order to avert immediate danger, and perhaps to accelerate cicatrization. If life continue, the tube must be permanently worn ; for, under the most favourable circumstances, it is not to be expected, in this affection, that the normal calibre and function can be regained.

Tracheal Fistula is apt to result from the preceding affection. The abscess connected with the necrosed portion of cartilage may discharge itself externally, as well as into the windpipe, and a fistulous aperture is not unlikely to remain. This may be brought to heal, by the occasional use, at long intervals, of the heated wire. But let no attempt at closure

be made, until we are certain that the necrosed portion has been fairly extruded, and that no fresh sequestrum is in progress there; otherwise, by confining the matter, and so causing swelling and obstruction, serious consequences to respiration may ensue.

Warts of the Larynx.

Warty excrescences have sometimes been found growing from the lining membrane of the larynx, at its upper part; and solid enlargements of structure, pendulous, pyriform, and of the nature of polypus, have also, though still more rarely, occurred. They necessarily impede respiration; and, by leading to an inflammatory accession, with its attendant œdema, they may bring life into sudden and imminent jeopardy. The symptoms of such chronic formations are necessarily obscure; and it is not easy to conceive how any treatment, likely to arrest or undo their progress, may be indicated. When the emergency by dyspnœa occurs, tracheotomy is plainly required. Through the wound an attempt might be made to remove the morbid formations, either by escharotics or by evulsion; failing this, the tube must be contentedly worn ever after. Fortunately, such affections are of very rare occurrence.

Stricture of the Windpipe.

Contraction of this tube is liable to occur, at various points, and from various causes; by contraction of the wound after cut throat; by contraction after cicatrization of ulcers; by change of structure following on chronic laryngitis, independent of ulceration; by necrosis and discharge of portions of cartilage, and consequent narrowing of the passage after closure of the ulcerated cavities. It is doubtful whether our art may be able to restore the normal calibre and function in such cases, by dilatation, as in similar affections of other mucous canals. The experiment has been made;* but the present voice of experience is as yet scarcely in favour of the

* LISTON, *Elements*, p. 453.

measure—except in the case of contraction after wound, (p. 249.) Life may often be protracted, however, and suffering alleviated, by the continued use of the tracheotomy tube, of full size ; and by unremitting attention to keep both tube and trachea free from accumulation of viscid mucus. The latter indication may become of easy fulfilment, in consequence of the tracheal and bronchial membrane losing much of its sensibility—becoming almost cutaneous in this respect, and not resenting a tolerably free use of probe, feather, sponge, or other means employed for clearing the passage.

Formation of matter near the Larynx.

Diffuse infiltration of purulent matter may take place, deeply, in the neck ; and the consequent swelling and tension may seriously incommode respiration, by encroaching on the canal of the windpipe. The proper remedy is free incision of the infiltrated part, whereby both cause and effect are at once removed. Should this fail, or should the symptoms prove obscure, so as not to warrant or even indicate incision, tracheotomy is certainly advisable.

Circumscribed abscess may form in the vicinity of the larynx. And the rules of practice are the same ; an early evacuating incision, if possible ; otherwise, tracheotomy.

Bronchotomy, then, is available, in the following cases :—

1. In the case of *foreign bodies* lodged in the air passages. Extrusion, independently of this operation, is and ought to be the exception to the general rule.
2. *In suspended animation* ; when we cannot otherwise effect, with certainty, artificial inflation of the lungs.
3. *In spasm* of the glottis. Threatened asphyxia, from external injury, may perhaps depend on this cause—perhaps on a precisely opposite condition ; in either case, the operation is imperatively demanded to save life. There is the same necessity, in the spasmodic occlusion of the glottis which attends poisoning by carbonic acid. In laryngismus stridulus, we withhold the operation if possible, and trust to general treatment ; yet are we aware that urgent circumstances may arise to demand the tracheal

wound, at least with the hope of palliation, and perhaps with the effect of affording time for the effectual working of other remedies. 4. In *œdema glottidis*, chronic and acute, there is no safety but by operation, so soon as the symptoms have become at all urgent. And, in the acute cases, there is the best hope of speedy discontinuance of the tube, closure of the artificial aperture, and complete restoration of normal respiration. 5. In *laryngitis fibrinosa*, the operation is as warrantable as in urgent œdema, when the disease is limited to the larynx. But in the great majority of cases of true croup, in which the whole windpipe with its ramifications is involved, operation is surely to be regarded as a rare exception to the general rule of non-interference; in the early stage, it is inexpedient, while mechanical obstruction to respiration is not yet threatened; in the more advanced period, it is ineffectual—failing to fulfil the objects of its performance. 6. In *purulent laryngitis*, there is the same necessity for operation, and the same good prospect as to its result, as in acute œdema. 7. In *chronic laryngitis*, with thickening, supervention of œdema, through inflammatory accession, may render the operation indispensable to the preservation of life. 8. In *simple ulceration*, the same event may occur, as that just mentioned in connexion with mere thickening of the membrane. Or, independently of the occurrence of such an accidental crisis, the operation may be deemed expedient, to assist the action of other remedial means, and by effecting early cicatrization to save structure and function. 9. In *ulceration, with disease of the cartilage*, operation is likely to be required to save life from immediate danger by threatened asphyxia; but with little or no prospect of discontinuance of the tube's use. 10. In *phthisis laryngea*, it may be similarly demanded for a temporary object; scarcely with a hope of contributing to a cure; but rather as a means of protraction and palliation. 11. In *pressure on the windpipe*, caused by the formation of tumour or abscess, or by impaction of food in the œsophagus or pharynx—operation may be necessary, if the obstruction to respiration cannot be otherwise relieved, namely, by removal of the cause; by evacuation of the matter, extirpation or diminution of the tumour, or extrusion of the impacted substance. 12. In *cut throat*, tracheotomy is not un-

frequently demanded, imperiously, to save life from impending asphyxia ; and it may be expedient, at an early period of the case, to avert all such hazard, and to favour as well as permit immediate and entire closure of the wound. 13. In *glossitis*, in *tonsillitis*, and in extreme cases of *pharyngitis*, it is required, when swelling is so great, rapid, and uncontrollable, as otherwise to render fatal asphyxia all but inevitable. 14. In *carotid aneurism* of large size—when, by circumstances, we are precluded from speedy recourse to deligation of the artery—life may be suddenly brought into peril, by supervention of the diffuse form on the circumscribed, and consequent compression of the windpipe. Bronchotomy then is essential ; and the tube will require to be worn, until, by deligation of the artery, we have effected such diminution in the bulk of the tumour as altogether to free the respiratory canal. *Thoracic aneurisms*, be it remembered, by compressing the air passages, may simulate the results of inflammatory disease in the larynx ; and, in such cases, no good can possibly be expected to result from bronchotomy.

In the great majority of cases, tracheotomy is preferable to laryngotomy, for obvious reasons.

The passing of tubes, by the nose or by the mouth, into the windpipe, has been proposed as a means of suspending bronchotomy in many cases. But modern experience limits their use to cases of suspended animation, unconnected with laryngeal or tracheal disease ; and even then, their superiority may come to be a matter of question and doubt.

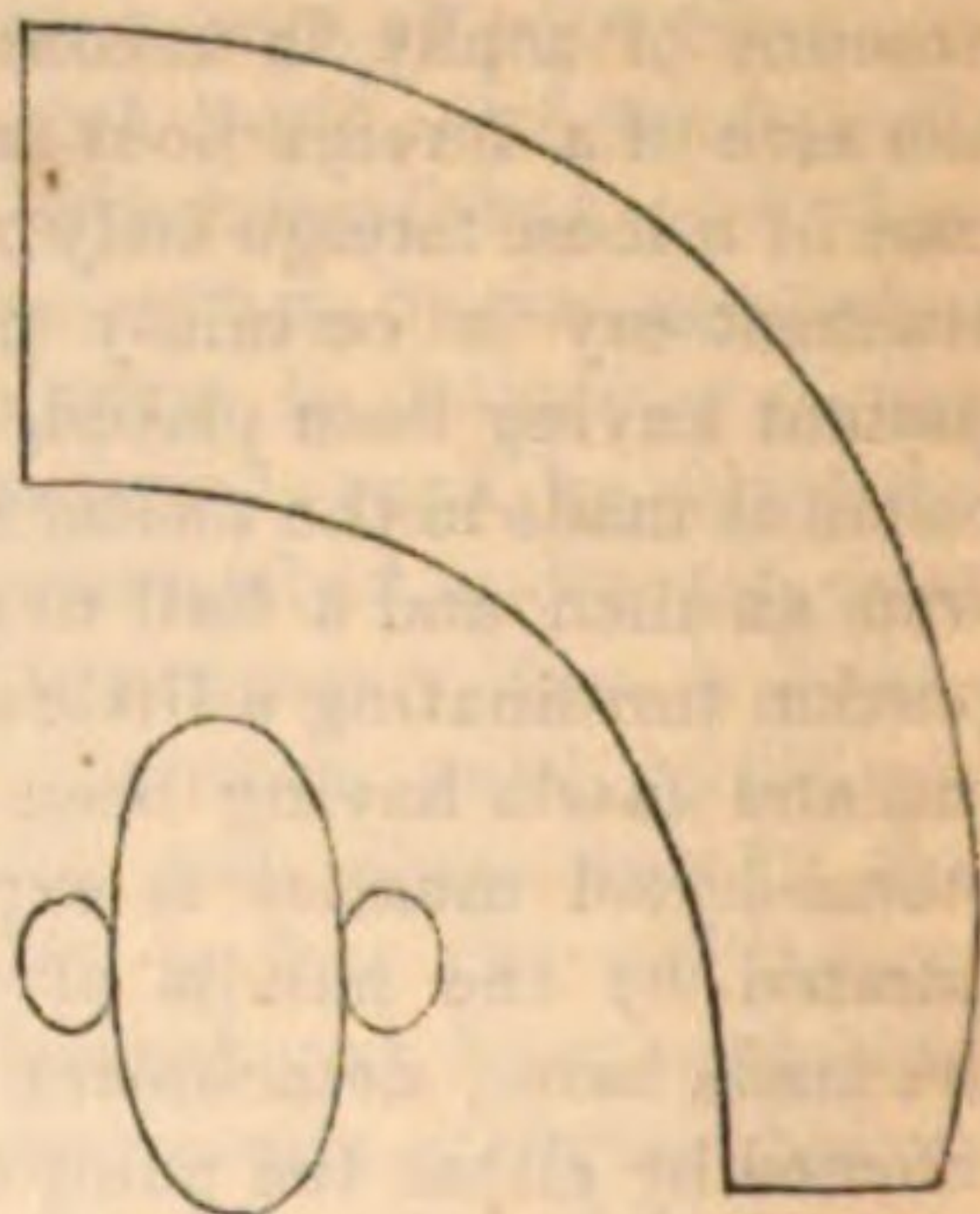
Laryngotomy.

The performance of this operation having been determined on, the patient is seated on a chair, with the head thrown back and steadied. A longitudinal incision is made over the box of the larynx, in the mesial space ; by dissection, the crico-thyroid membrane is exposed ; and through this an opening is then made by the knife—as free as the cartilaginous boundaries of the space will allow. There will seldom be any trouble by hæmorrhage.

Tracheotomy.

Except in the case of attempting artificial respiration on account of asphyxia unconnected with laryngeal disease, in the case of a foreign body impacted in the rima, and in the case of a loose foreign body of small size within the windpipe, tracheotomy is certainly preferable to laryngotomy. The patient having been placed, as for the latter operation, an incision is made in the mesial line of the lower part of the neck, from an inch and a half to two inches in length, the upper portion terminating a little above the cricoid cartilage. Skin, fat, and fascia having been divided, the commissure of the sterno-hyoid muscles is exposed; and this is carefully separated by the handle of the knife. The tracheal rings are made bare; detachment of the cellular investment being effected by either the point or handle of the knife, according to circumstances. Then the patient, if adult and conscious, is directed to swallow saliva. While the windpipe is rendered tense and elongated in the act of deglutition, the scalpel is made to penetrate at the lower part of the wound, with its back to the sternum; and, by a sawing movement of the instrument upwards, the necessary extent of tracheal wound is completed; the thyroid gland being pushed out of harm's way, by the finger—upwards. If the operation have been undertaken on account of the lodgement of a foreign body, no tube is necessary. The wound having been made, the foreign substance, if loose, will at once be expelled; if not, it is to be sought for by probe and forceps, as formerly stated. In the case of disease, it is our object to establish a constant and sufficient aperture for respiration, at the site of the wound; accordingly a curved silver canula is introduced; and this is retained by tapes passing from a ring on each side of the canula, to be secured behind the neck. The canula is of sufficient size to atone, completely, for the temporarily occluded rima; varying, consequently, according to age; and, generally, of not much less diameter than the trachea which receives it. Yet let it not be so large as to press harshly on the lining membrane of the passage, so inducing ulceration.

The wound should be of size sufficient to receive the canula, without force, and yet not too freely; the cut margins should be compressed by the canula, internal escape of blood being so prevented; and this object is further contributed to by the conical form of the instrument. The patient is laid on his side, so as to render the wound dependent, and favourable to the outward escape of blood and mucus. After a time, when the conical form of the tube is no longer an advantage, on account of hæmorrhage, an instrument of uniform calibre may be substituted, as more suitable for respiration.



The circumstance of the canula's introduction being itself an efficient hæmostatic means, materially facilitates the performance of the operation. For, it is not necessary to wait for entire cessation of bleeding, before opening the windpipe; no valuable time need be lost in stemming oozing; main jets of blood, if any, having been secured, the tracheal wound is at once made, and the tube as speedily introduced. At first the presence of the foreign body, and of the small quantity of blood which has necessarily entered along with it, is much resented; a violent fit of spasmodic cough, threatening suffocation, ensues; but the blood having been thrown back, through the tube, this fit of irritation passes off, and comparatively calm respiration is speedily established through the artificial opening. For many hours—but more especially during the first few—the patient must be carefully watched, lest the tube become obstructed by mucus; and this is from time to time to be cleared away, by a probe armed with lint or sponge, or by a feather; or the canula may be double, admitting of one portion remaining in the wound, while the other is withdrawn and cleaned occasionally. And such attention is particularly necessary, as formerly stated, if the

patient have fallen asleep after the operation. When expectoration is attempted, it is necessary to diminish the aperture of the tube very considerably, by temporary application of the finger ; so that the expired air may be expelled forcibly ; at first, this narrowing is made by the surgeon, but soon the patient becomes an adept in the simple manipulation. Should he grow too weak to expectorate, it is well to attempt extraction of the mucus by suction ; by the adaptation of a syringe, or by the mouth of an assistant—if possible.

As already seen, in some cases the tube may be withdrawn, and the wound permanently closed, after a few days, or weeks ; in other cases, the normal respiration can never be restored, and the tube must be worn during the remainder of life. And in these latter, it is truly surprising how little inconvenience is sustained ; respiration becomes easy and silent, and sometimes even the voice is in some slight degree regained.

The prominent danger of the operation is by hæmorrhage. During the incisions, this is to be guarded against, by caution in the placing and making of them ; more especially avoiding the large veins which are often to be found in the lower and front part of the neck ; and if any stray vessel be encountered, let it be held carefully out of the way by an assistant. Arterial branches, which spring, are to be secured by ligature ; to venous orifices, temporary pressure is applied. On account of venous bleeding, however, no great delay should take place ; more especially when the operation is being performed on account of dyspnœa ; for the most likely means of freeing respiration, consequently favouring venous return, and obtaining a comparatively quiescent and empty state of the veins implicated, is by lodging the tube in the tracheal wound.

In all cases, it is obviously of much importance to keep the patient in an equable and genial temperature, to cover the wound with some cloth of loose texture, and to take every other means which may suggest themselves, as likely to ward off the accession of inflammatory action by the stimulus of cold air directly applied to the membrane—as in the case of cut throat.

In the child the operation may be rendered extremely difficult; by the restlessness of the patient, the crying and struggling which engorge the veins, the small size of the trachea, the limited space of the neck, the number of veins likely to be encountered, and the intolerance of loss of blood on the part of the system. The dissection must be conducted with unusual caution; and it is well, after exposure of the trachea, to fix it by means of a sharp hook, so as at once to facilitate and render more safe the performance of the tracheal wound. So soon as this has been effected, the child should be instantly turned upon its face, so as to prevent, as far as possible, the escape of blood into the trachea. On cessation of the hæmorrhage, the ordinary position may be again resumed, should the circumstances of the case render this expedient.

Bronchocele, or Goitre.

The term denotes a swelling of the thyroid gland; and this may be of various kinds. 1. *Mere hypertrophy* of the gland is probably the most frequent form; the enlargement being essentially chronic and very gradual; and ultimately making a transition into the state of simple tumour, (*Principles*, p. 537.) The whole gland may be equally involved; or the isthmus alone may enlarge, while the lobes remain of a normal character; more frequently one or other lobe is the seat of the partial affection; and sometimes both lobes are involved while the central portion remains free. And, indeed, the same remarks, as to the partial or general character of the swelling, apply to the other varieties of the affection. 2. The swelling may be of a *cystic* nature; the stroma being analogous to the structure of simple tumour; the cysts numerous and small, more frequently few and capacious, delicate, and filled with a glairy fluid. 3. The simple stroma may contain a greater or less amount of *calcareous* matter; giving much density to the tumour, which is seldom then of large size. 5. The tumour may be *malignant*. Carcinoma is rare. Cephaloma, which is not so, follows its ordinary course, and presents its usual characters. By far the most frequent varieties, however, are the Simple and the Cystic.

Bronchocele is, in certain localities, an endemic disorder. In the Tyrol, and in the valley of the Rhone, it is especially so ; and is there almost invariably associated with a sadly deteriorated condition of the frame, to which the term Cretinism has been applied. In this country, the disease is comparatively rare, and happily no such unfortunate combination exists. In Derbyshire, especially, it merits the appellation of endemic. The great majority of the patients are female ; and the ordinary period of invasion is about the time of puberty. The most prominent symptom is the inconvenience, with deformity, occasioned by the bulky swelling. Growth is gradual and painless—unless in the malignant variety. The indications by touch vary according to the nature of the interior. As the tumour enlarges, the head becomes disordered, in consequence of venous return thence being interfered with ; and respiration also is more or less seriously impeded, by the pressure on the windpipe—more especially when the central portion of the gland is affected. Partial enlargement—affecting but one lobe—is apt to simulate carotid aneurism, receiving a decided impulse from the adjacent vessel ; and careful manipulation is necessary to arrive at a correct diagnosis. In addition to the ordinary diagnostics, (*Principles*, p. 439,) it is to be borne in mind, that, on deglutition being performed, a bronchocele will be found to move upwards with the larynx, while an aneurism remains unaffected.

The causes of the disease are scarcely yet evolved from obscurity. Where endemic, it seems certainly connected with habitual use of unwholesome water, as an article of food, and habitual exposure to a humid atmosphere ; and this circumstance necessarily possesses an important bearing on the treatment.

Treatment.—In reference to treatment, the examples of this disease may be conveniently divided into two classes ; those which are merely deformities, unseemly and somewhat troublesome by their bulk ; and those which bring life into peril, directly or indirectly, by interference with the brain and the air passages. For the latter, the most determined remedial means may be with all propriety resorted to ; for the former,

heroics are never warrantable. And, fortunately, the majority of cases, in this country, demand only the milder form of treatment. Iodine has long been regarded as the most powerful remedy; and justly. Internally, it is administered in the form of iodide of potassium—or otherwise combined, as with iron, if the other be found to disagree. Externally, it is best applied in the form of solution, painted frequently on the swelling; moderate leeching having been premised, in those cases in which a continuance of nutritive excitement may seem to render such a measure expedient; arresting growth, as well as discussing bulk already attained. At the same time, habitual exposure to a dry and otherwise salubrious atmosphere, with habitual use of sound water—chalybeate if possible—are curative indications by no means to be neglected.

Central tumours, pressing on the windpipe, may be removed by operation, when of no great size; partly by excision, partly by deligation. By the scalpel the integuments are freely divided, and turned aside; the tumour is laterally separated from its connexions, care being taken to secure each arterial orifice by ligature, so soon as divided, and each venous orifice—as far as possible—by pressure of the fingers of an assistant; and having proceeded as far with the knife, in the work of detachment, as prudence will allow, the remainder of the connexions are to be included tightly in ligature. A strong needle is passed beneath the base of the tumour, the double ligature is divided, and each portion is tied separately, so as to strangulate the mass. Tumours of the isthmus have been thus removed successfully; and it is probable that the same principle of operation may be safely extended to other swellings not limited to that part of the gland.

Large, solid bronchoceles, involving the whole gland, and of greatest bulk laterally, are not amenable to radical cure. Their size, site, and attachments preclude the use of ligature; and attempted removal by the knife could scarcely fail to prove fatal by hæmorrhage. We must be content to palliate what we cannot cure. By judicious use of iodine, growth may be delayed, and even some impression may be made on the bulk; and, ultimately, life may be protracted, and great

relief afforded, by subcutaneous section of one or both sternomastoid muscles, so as to diminish tension, favour outward growth, and relieve the trachea and jugular from compression. In some cases also, protraction and palliation may be obtained by tracheotomy; when the circumstances of the case are such as to render the performance of that operation practicable.

For the cystic bronchocele, the use of a seton is very suitable. The cyst having been punctured, and its contents evacuated, a few threads of silk may be passed through the substance of the swelling, and retained. It is probable that the inflammatory result will lead to obliteration of the cystic formation; but much care is necessary in watching the excited action, lest it prove excessive, and threaten asphyxia through sudden and great enlargement of the swelling. For the solid tumours, however, the seton is not well adapted; it not only fails to discuss, but is also exceedingly prone to accelerate growth.

Deligation of the thyroid arteries has been practised; but without success. The malignant bronchoceles—fortunately rare—are incurable.

Tumours over the Thyroid Gland.

Not unfrequently cystic formations are found, not in the substance of the thyroid gland, but between this and the integument. If of small size and circumscribed, they may be dissected out. Those which are large and diffuse may be treated by the seton.

Enlargement of the Hyo-thyroid Bursa.

Like other bursæ, that which is situated between the hyoid bone and thyroid cartilage is liable to enlargement, chronic and acute; causing more or less swelling, with pain, and obstruction to the movements of the neck. The acute form is met by repeated leeching and fomentation; the chronic is appropriately treated by the local application of iodine in solution, or by other discutients.

Hernia Bronchalis.

A rare affection, so called, has been observed in those who habitually strain the throat in loud and sustained calling. A fold of the lining membrane is protruded outwards between two tracheal cartilages ; and thus a greater or less tumour, soft and compressible, is formed, according to the extent of protrusion. The only remedial means advisable are such outward applications as are likely, by affording external support, to oppose further protrusion. And the exciting cause—straining of the throat—is, of course, to be discontinued.

Disease of the Cervical Vertebrae.

The chain of cervical vertebrae, like other bones with their articulating surfaces, is liable to disease of various kinds :—
1. The bodies of the vertebrae may be interstitially absorbed. Then, a greater or less degree of curvature is likely to ensue ; the head usually bending forwards, with a deviation to one or other side ; and, not unfrequently, there is thickening of the soft parts exteriorly, in consequence of a chronic inflammatory process slowly advancing there. 2. Or the bodies of the vertebrae are affected by the results of true inflammation. Their substance is eroded by ulceration, matter is formed around, and portions may be detached in the form of sequestra. There are pain, swelling, tenderness on pressure, and the other usual signs of an advancing action of disorganization. More or less deformity, by curvature, necessarily ensues ; partly from change in the bones, partly from a wasted and paralyzed state of the extensor muscles. As can be readily understood, deglutition is early and much interfered with ; and by encroachment on, and involvement of, the cervical nerves, serious results are likely to occur, as regards respiration. The functions of the superior extremities, too, may be perilled, by affection of the brachial plexus. The disease is generally connected, in the patient's narrative, with external injury ; and the persons most likely to be affected are the young and strumous. 3. Or the disease may originate in the articulating textures ; ultimately inducing similarly destructive results. 4. There is good reason to believe

that, not unfrequently, such affections follow in regular succession ; the diseased action commencing in interstitial absorption of the bones, advancing from absorption to true inflammation, and ultimately disorganizing both bone and joint.

The obvious treatment of such disease, is to endeavour to arrest its course by leeching and counter-irritation—the latter of the graver sort, and patiently continued ; to keep the part at rest ; and, in the advanced cases, to relieve the affected bones from the weight of the head, as much as possible, by mechanical means. A firm iron rod, fixed in a circular girth on the trunk, passes upwards, excurvating to receive the posterior part of the head, and terminating over the forehead ; and by a bandage or strap attached to the extremity of the rod, and passed under the chin, the required support is afforded. All suddenness of motion in the neck is especially to be avoided ; but indeed, in most cases, the patient has an instinctive dread of such risk, and carefully guards against it ; turning the neck slowly, and with the chin supported on the hand. In the case of disease affecting the atlas and dentata, such precaution is particularly necessary ; lest by sudden rupture of the ligamentous apparatus, displacement should occur, causing fatal compression of the medulla. Should matter form in considerable quantity, and seek to approach the surface, at the lateral or posterior part of the neck, a free and early incision is to be made, for evacuation. In the advanced cases, the only hope of cure is by ankylosis.

CHAPTER XIX.

AFFECTIONS OF THE ARTERIES OF THE NECK AND SUPERIOR EXTREMITY.

Deligation of the Carotid.

The common carotid artery may require deligation on account of aneurism, hæmorrhage by ulcer or wound, or

erectile tumour in the orbit. Carotid aneurism is usually situated at the upper part of the vessel, near the angle of the jaw ; forming a tumour there of the ordinary characters, which, becoming diffuse, may seriously interfere with respiration. It possesses a peculiarity of being ill surrounded by repressing tissues ; it grows chiefly towards the pharynx, and may imperfectly consolidate after operation, (*Principles*, p. 453.) Sometimes—but fortunately comparatively seldom—the disease affects the origin of the artery ; and then the interference with respiration is more early and serious. It may happen, from sudden increase of the tumour—by diffusion or otherwise—that immediate performance of tracheotomy is demanded to save from urgent threatening of asphyxia.

The artery may be secured at one of two points ; above or below where it is crossed by the omo-hyoid muscle. The former situation is the more easy of access, and is to be preferred when circumstances are favourable ; but in cases of aneurism, the tumour will generally be found to have encroached too far on the upper triangular space.

The superior operation is performed thus. The patient having been placed recumbent, with the head thrown back and turned slightly to the opposite side, an incision is made through the integuments, platysma myoides, and superficial fascia, extending in the direction of the inner border of the sterno-mastoid muscle, from near the angle of the jaw to the level of the cricoid cartilage. The deep fascia is carefully divided, with the use of forceps ; cross veins are looked for, and avoided ; the margins of the wound are held asunder by means of bent copper spatulae ; and it may be useful to relax the parts somewhat, by changing the position of the head. The descendens noni is pushed aside ; the common sheath of the vessels, having been pinched up by forceps, is laid open to the requisite extent ; and cautious isolation of the artery is proceeded with, so as to afford clear space for passage of the aneurism needle—and no more. The needle is passed from the outside ; the jugular vein being repressed, if necessary ; and thus the risk is avoided of injuring the vein, or including the par vagum.* Before securing the

* From inattention to this rule, at an early period of my professional life, I had the misfortune to include the par vagum in the noose of the ligature. But

knot, especial care should be taken to ascertain that nothing but the arterial coats is included.

The inferior operation is more generally suitable in the case of aneurism, as already explained. The patient having been placed as before, an incision of about three inches in length, parallel to the inner border of the sterno-mastoid, is begun a little above the level of the cricoid cartilage. The inner-border of the muscle, having been exposed, is cautiously turned outwards ; while the sterno-hyoid and sterno-thyroid muscles are displaced in the opposite direction. The deep fascia is divided below the crossing of the omo-hyoid muscle ; and, the sheath having been opened into, the operation is completed as before. The descendens noni, in the former case in front of the sheath, is here found inclining to the tracheal side of the artery. On the left side, the jugular vein is very apt to prove troublesome by overlapping ; on the right side, it recedes from the carotid, to meet the subclavian vein.

After the operation, congestion of the lungs, with its baneful consequences, must be guarded against by the use of the lancet. And, in the case of aneurism at the angle of the jaw, external pressure is to be made on the tumour, so as to atone for the deficiency of repressive textures, formerly alluded to. It is well, also, to keep the neck bent, so as to relax the artery.

In the case of aneurism at the root of the common carotid, deligation of the artery at its upper part may be practised, with a reasonable hope of cure. For, as formerly stated, (*Principles*, p. 454,) the common carotid is favourably adapted for Brasdor's operation.

Deligation of the external carotid, and its branches, is required only in the case of hæmorrhage ; and chiefly on account of wound. No definite rules need be given as to the operative procedure ; this must be guided by the general principles formerly inculcated, (*Principles*, pp. 446, 505,) and modified by the particular circumstances of the case.

it is some consolation to know that the accident was, in all probability, unconnected with the fatal issue of the case. I willingly record the circumstance here ; that it may be of use, as a beacon, to deter and warn others from similar inattention and mishap.

Deligation of the Arteria Anonyma is an operation now considered hopeless ; and, in all probability, will never be repeated by any judicious surgeon ; circumstances seeming to be all insuperably hostile to satisfactory occlusion of the artery at the deligated point.

Deligation of the Subclavian.

This artery requires ligature, on account of axillary aneurism. Hæmorrhage by wound or ulcer is likely to call for the operation but rarely.

Surgically, the vessel is conveniently divided into three portions ; internal, from its origin to the inner-border of the scaleni ; middle, where overlaid by the anterior scalenus ; external, between the outer-border of this muscle and the passage over the first rib. On the right side, it is possible to secure the artery at any of these parts of its course ; on the left, the two last only are practicable, the internal third being not only very deeply seated, but in close contact with most important parts, which can scarcely fail to sustain most serious injury in the attempt. On either side, the middle third is not desirable ; there being great risk of serious injury to the phrenic nerve, in the incisions, and a great probability of unsatisfactory occlusion on account of the near proximity of large collateral branches at the deligated point. The external third is preferred. But if, in performance of the ordinary operation on this part of the vessel, the coats appear unsound, we are fully warranted in cautiously turning aside the scalenus muscle, and in seeking upwards for a more healthy portion.

Deligation of the external third is accomplished thus :—The patient having been placed recumbent, on rather a high table, and the elevated shoulder having been forcibly depressed as much as possible, an incision is made over the clavicle, through the skin and platysma myoides ; extending from the anterior border of the trapezius, to a little beyond the posterior border of the sterno-mastoid. And it is well to pull the skin downwards before using the knife, so that, on resilience, the wound may be more directly correspondent with the

course of the vessel. A minor incision is made to fall into the first, passing along the posterior border of the sterno-mastoid; and the flap thus indicated is slightly reflected. The cervical fascia is divided; the external jugular-vein is looked for, and turned aside; the posterior belly of the omo-hyoid is disclosed; and then we know that in the triangular space between that and the clavicle, is contained the object of our search. The outer edge of the scalenus muscle is sought for; at the same time a part of the brachial plexus is brought into view; and now the field of search is further limited; the artery will be found by tracing the border of the muscle downwards, on a lower and more anterior plane than the portion of the plexus exposed. Placing our finger on the tubercle of the first rib, the artery will be felt pulsating between; and the knife is guided accordingly. The vessel having been reached, is cautiously isolated to the requisite extent; and the needle is passed from the clavicular aspect, so as to avoid injury of the concomitant vein. Before securing the noose, pressure should be made by the finger on the included texture, so as to make sure that it is the artery. In making the downward dissection, caution is necessary near the clavicle; lest, first, the supra-scapular artery be wounded; and, afterwards, lest the vein should sustain injury. The artery, if injured, proves troublesome by hæmorrhage; and, besides, the vessel is important as a means of collateral circulation after obstruction of the main trunk. In the great depth which has sometimes to be encountered in this situation, it may be that assistance will be derived from one or other of the auxiliary needles which have been invented; but it has so happened, hitherto, that the ordinary instrument, in skilful hands, has been found quite sufficient. In all cases, however, difficulty is to be contemplated; and in the dissection, allowance must always be made for the increased depth of the vessel's site, resulting from displacement of the shoulder upwards by the axillary tumour.

To secure the middle third, a plan of incision very similar to that just described will suffice. The fibres of the scalenus are cut across with the greatest possible caution, so as to avoid injury of the phrenic nerve, which may be expected towards the inner margin; and the noose is applied with equal cau-

tion, to avoid, as far as possible, the arterial branches of this part of the vessel.

To expose the internal third, on the right side, let an incision be made a little above the clavicle, more anteriorly than in the former operations; and into this a second incision is made to fall, along the inner border of the sterno-mastoid. The sternal attachment of this muscle is then divided and turned aside, outwards. The sterno-hyoid and sterno-thyroid muscles, having been exposed, are divided cautiously from their outer border, and displaced forwards. The lower part of the carotid may then come into view; this is traced downwards, until the subclavian is reached; and then this vessel is to be secured, neatly and accurately, as near as possible to the origin of the vertebral, so as to afford space enough between the ligature and the origin of the carotid. The textures to be avoided are the par vagum, and its recurrent branch, the cardiac branches of the sympathetic, the pleura, and the vein. The needle is to be passed from below upwards, so as to avoid wounding the pleura and right vena innominata. The operation is one of great difficulty, and not auspicious of a prosperous issue.

The variety of distribution to which the arteries of the neck are liable, bears an important relation to the operations just described, and should ever be remembered and calculated upon by the surgeon.

Deligation of the Axillary.

Modern surgeons seem to have almost agreed, that this vessel should not be made the subject of operation, unless in the case of wound of itself; when the general principles of surgery are to be fulfilled, by cutting down upon the bleeding point, and placing a ligature above and below the aperture. In the case of aneurism high in the arm, encroaching so far upwards as to render deligation of the humeral either unadvisable or impracticable, the axillary, no doubt, may be secured; but it is an easier, a more likely to prove prosperous, and consequently a preferable operation, to tie the subclavian in its external third.

Like the subclavian, the axillary artery is surgically divided into three portions ; an upper, middle, and lower. And, supposing that we have determined on deligation of the axillary, in preference to that of the subclavian—as, probably, will very seldom be the case—either the lower or the upper third will be selected, seeing that the middle is so covered and mixed up with other textures, as to be almost inaccessible—with safety. The operation, accordingly, is said to be either superior or inferior.

The superior operation is performed thus:—The patient having been placed recumbent, with an assistant ready to compress the subclavian in case of accident, an incision is made, about three inches in length, and of a semilunar form—with its convexity downwards ; commencing about an inch from the sternal extremity of the clavicle, and extending towards the acromion. Or a similar extent of wound may be made, with its convexity upwards, terminating at the anterior margin of the deltoid. In the one case, the clavicular portion of the pectoralis major is at once cut across, in the deep dissection ; in the other, the intermuscular space is dilated. Care must be taken to avoid the cephalic vein and thoracico-acromialis artery. To expose the latter vessel, however, is scarcely an untoward occurrence, as it may happen to prove a convenient guide to the vessel of which we are in search. The deep fascia and fat are carefully cut through ; and it may be necessary to turn down the upper border of the pectoralis minor. The vein, probably, will then be first disclosed ; this is pressed inwards towards the ribs ; and, the artery having been carefully isolated to the requisite extent, the needle is passed from the thoracic to the acromial aspect.

For the inferior operation, the arm is raised from the side, with the hand supinated. In the lower part of the axilla, thus exposed, the head of the humerus is felt ; and over this, an incision is made of about two inches in length, rather more to the posterior than to the anterior border of the axilla. Then, on dissecting through fascia and cellular tissue, the axillary vein and median nerve are likely to be exposed ; the latter having been displaced outwards, and the former inwards, the artery will be brought into view. The needle is passed from the ulnar aspect. In the latter part of the ope-

ration, it is useful to relax the textures, by bending the forearm.

Deligation of the Humeral.

The brachial or humeral artery may be secured at any part of its course; on account of aneurism, true or false; on account of wound of the vessel itself; or on account of an otherwise uncontrollable hæmorrhage from either the hand or the forearm. The arm having been steadied on a convenient table, with the hand supinated, the operation is conducted thus:—

In the upper part of the arm, an incision of about two inches in length is placed over the vessel—felt pulsating—along the inner border of the coraco-brachialis muscle; and care is taken to avoid the basilic vein and internal cutaneous nerve, which may lie in the way. The fascia having been divided, the ulnar and internal cutaneous nerves, on the inside—the external cutaneous and median nerves, on the outside—the brachial veins close on each side—are avoided; the arm being bent, for the purpose of relaxing these tissues, if necessary. And the vessel having been isolated, the needle is passed from the ulnar aspect. Sometimes the median nerve is superficial to the artery.

At the middle of the arm, the incision is made along the inner border of the biceps muscle, which, overlapping the vessel, may require to be raised slightly. The median nerve is to be expected, superficial to the blood-vessels; and while this nerve is displaced inwards, and the muscle held outwards, the artery may be separated from its veins and secured. It is right to remember, however, that, in this situation, the inferior profunda may be mistaken for the main trunk; and also that, there being a high division of the humeral, one of the two vessels only may have been tied. Not until the surgeon has been fully satisfied on both of these points, should the operation be completed by approximation of the wound.

In the lower part of the arm, the median nerve is to be expected on the ulnar side of the artery; but it is seldom that we are called upon to operate in this situation; not, indeed, unless for wound of that part of the vessel.

At the bend of the arm, false aneurism of the humeral is proverbially common. Its nature and progress have been already described, (*Principles*, p. 432.) If prevention, by methodical pressure, have failed, the sac is to be cut into, and the vessel secured by ligature above and below the aperture, in recent cases. In tumours of old standing, deligation of the humeral, near its middle, is a simpler and equally effectual operation, (*Principles*, p. 466, *et seq.*) Varicose aneurism, occurring at this site, requires the same treatment as the ordinary form of tumour. For aneurismal varix, support by careful bandaging is usually sufficient, (*Principles*, p. 468, *et seq.*)

Deligation of the Arteries of the Fore-arm.

Deligation of these vessels is seldom if ever required, except in the case of hæmorrhage by wound of themselves; and then it is sufficient to dilate the existing wound, and to secure the bleeding point, or points, in the usual way. For secondary bleeding in the palm, ligature of both ulnar and radial would not suffice; the interosseous must also be secured. And, instead of this threefold and difficult operation, it is infinitely better at once to perform that which, while much simpler, is equally effectual—deligation of the humeral a little below its middle.

The radial and ulnar arteries are most easily reached at the lower part of the fore-arm. For the radial, an incision is made on the radial side of flexor carpi radialis. For the ulnar, the wound is placed on the radial side of the flexor carpi ulnaris. Near the elbow joint, the vessels can be exposed only through a great thickness of muscular tissue. The prolongation of the radial, between the metacarpal bones of the thumb and forefinger, may be exposed by an incision on the ulnar aspect of the extensor secundi internodii pollicis.

Wounds of the Palmar Arch are apt to be troublesome by bleeding, both primarily and secondarily. In recent wounds, all bleeding points should be secured by ligature; dilatation being practised, if necessary, and moderate pressure afterwards applied. For bleeding occurring after the lapse of some days, exposure of the wound, with application of energetic pres-

sure, (*Principles*, p. 498,) should be had recourse to ; and if this fail, then deligation of the humeral should be practised.

CHAPTER XX.

AFFECTIONS OF THE BEND OF THE ARM.

Venesection.

THIS little operation—still, perhaps, too frequently performed—is conducted thus. The patient having been placed erect, semi-erect, or recumbent, according as it is wished to withdraw much blood or otherwise, (*Principles*, p. 115,) a ligature—as riband, or bandage, or a small tourniquet—is placed on the upper part of the arm, and secured with sufficient tightness to arrest the venous return, and yet not so tightly as to interfere with the arterial influx—as indicated by the pulse at the wrist. The veins at the bend of the arm, thus made tense and bulging, are scrutinized with a view to selection. A branch which is superficial, and large enough to emit freely, is to be preferred, for obvious reasons ; and, if possible, the median cephalic is chosen ; for then we are both less likely to interfere with the brachial artery, and less likely to wound either the fascia of the fore-arm, or the cutaneous nerves ; and thus are avoided the risks of aneurism, diffuse inflammatory infiltration, and neuralgic pain. But if no vessel except that over the brachial is found suitable—as not unfrequently is the case—then the operation must be conducted with especial caution ; care being taken merely to open, not to transfix the vein. The arm is placed nearly in a middle posture between pronation and supination ; and precautions are taken to secure its being retained in that position unmoved. By the fingers or thumb of one hand—and it is well that the surgeon be ambidextrous in this proceeding—the vein is steadied ; and, pressure being made at the same time on the distal aspect, spurting from the puncture is pre-

vented. The lancet—neither too spear-pointed nor too rounded in its blade—held between the finger and thumb of the other hand, is introduced obliquely across the track of the vessel; and by a gentle movement of it a sufficient aperture is made—the instrument being used so as, by cutting more with the shoulder than the point, to ensure the superficial part of the wound being considerably more free than the venous orifice. Then the blood is allowed to flow. If the stream grow sluggish, movement of the fingers will tend to its increase by forcing the contents of the intermuscular veins to the surface, and accelerating the general venous return; but care must be taken to avoid any deviation from the original position of the limb, otherwise overlapping of the wound by integument will necessarily follow. The desired effect having been obtained, the ligature on the arm is slackened and removed; the thumb is placed on the wound; the arm is sponged and made clean; a neatly fitting graduated compress is applied; by a bandage passed in the form of 8, all is secured; and the limb is placed comfortably in a bent posture, supported if need be by a sling. Within forty-eight hours, the bandage may be safely withdrawn; but it is well to avoid use of the arm for some days.

Accidents of Venesection.

1. *Thrombus*.—By this term is understood an accumulation of coagulated blood in the cellular tissue between the vein and the integument; caused probably by overlapping of the latter; interfering with, and perhaps arresting, the flow of blood at the time of the operation; producing an inconvenient swelling afterwards; and not unfrequently inducing troublesome suppuration in and around the wound. The accident is to be avoided, by a suitably free opening being made at once, and by maintenance of one position of the arm throughout the whole proceeding. When thrombus has formed, the coagulum should be carefully removed, an enlargement of the wound being had recourse to, if necessary; and then a suitable compress is accurately applied, so as to keep the tissues in close contact. 2. *Neuralgic pains* may invade the limb; dependent, probably, on puncture of a cutaneous nerve. To

avoid such accident, place the wound, where this texture is least likely to be implicated; to cure it, dilate the wound by incision, and apply an anodyne epithem. 3. Simple *erysipelas* may follow; and the ordinary treatment is required. 4. *Angeioleucitis* may occur *per se*, or in conjunction with the preceding affection. There is no peculiarity in the treatment. 5. Not unfrequently, a *diffuse inflammatory action* occurs beneath the fascia, which has probably been injured by puncture. Free incision is imperatively necessary; otherwise serious results, both locally and constitutionally, are almost certain to ensue. 6. Sometimes this last accident is associated with a superficial and simple erysipelas, or erythema. 7. *Aneurismal formations* have been already considered. And in reference to these it is well to remember, that the arteries of the fore-arm, following an unusual course, may be found quite superficial, and not unlike the ordinary veins. Hence a careful examination of the part should uniformly precede the performance of the operation.

Affections of the Bursa over the Olecranon.

From habitual pressure—as in the miner—this bursa is liable to chronic enlargement, and the affection is to be treated in the ordinary way; by abstraction of pressure, and the application of discutients. (*Principles*, p. 420.)

Acute bursitis is a frequent consequence of blows on the elbow; and is usually associated with an erysipelatous affection of the surface. The treatment is by puncture and general antiphlogistics; and if matter form within the bursa, it should be early evacuated by free incision.

CHAPTER XXI.

AFFECTIONS OF THE WRIST AND HAND.

Ganglia and Thecal Collections.

GANGLIA very frequently form on the wrist and back of the hand. When troublesome as well as unseemly, they may be got rid of, either by pressure, or by puncture of the cyst. (*Principles*, p. 422.)

Collections of glairy fluid very frequently form in the thecæ of the flexor tendons in the lower part of the fore-arm, with or without loose bodies contained; forming a soft bulging swelling, which usually extends also to the palm; and more or less seriously interfering with the functions as well as with the symmetry of the limb. In severe cases, it has latterly been the practice to make a free evacuating incision, dividing the annular ligament at the wrist completely through, in the belief that thus tension during the subsequent inflammatory accession will be avoided. But experience has yet to show, that the deformity and loss of power which result from the condensation and deposit among the tendons by such cure, are less than those which attended the previously existing state of parts. I am inclined to follow, as yet, the more cautious procedure elsewhere detailed. (*Principles*, p. 421.)

According to M. Velpeau, it is both safe and effectual to evacuate the contents by a trocar's puncture; and then to inject iodine—as in the cure of hydrocele.

Paronychia.

No affection is more common than paronychia, or *Whitlow*; more especially among washerwomen, cooks, and others, whose fingers, by the nature of their avocations, are not only kept prone to the assumption of inflammatory action, but also much exposed to the application of its exciting causes. The disease varies both in site and intensity.

1. There is a mild form, limited to the very surface. The

finger, at its point, and perhaps in its whole extent, is intensely hot and painful, red, and somewhat swollen; and vesications may be in process of forming. The treatment consists in leeching, fomentation, and general antiphlogistics. Or—as is more frequently practised—the part is rubbed lightly over with nitrate of silver, so as to blacken and desiccate the surface. Resolution is usually effected; but very often not without the formation of one or more vesicles—which sometimes degenerate into superficial ulcers of an irritable character. The disease usually commences at the root of the nail, a hot and painful blush of redness surrounding this; and hence the term. The matrix of the nail, often, being primarily and permanently affected, shedding of the nail need be no unlooked-for event.

2. A somewhat more serious action is found to pervade the subcutaneous cellular tissue, as well as the skin; bearing the same analogy to the former affection, as phlegmonous erysipelas does to erythema. It usually is caused by a puncture, laceration, or other wound; with or without inoculation of irritant matter. The swelling, heat, redness, tension, and pain are greater; and there is a proneness towards acute suppuration. Treatment must be proportionally active; copious leeching, at the sides of the finger; or free puncturing of the affected parts; active constitutional antiphlogistics; fomentation and poultice; early incision, if need be, as in phlegmonous erysipelas—not waiting till diffuse suppuration has formed. (*Principles*, p. 288.)

3. The worst form is the most deeply seated; and, unfortunately, not the least frequent in occurrence. The action originates in the deep fibrous textures; sometimes, there is every reason to believe, in the periosteum, or immediately exterior to it. Pain is excruciating from the first. For days and nights the patient may enjoy not a moment's sleep, or respite from suffering. Tension and throbbing are early and intense; so are the swelling, heat, and redness. The back of the hand, and sometimes part of the fore-arm, are red and greatly engorged with serous effusion. Matter forms early in the finger; deep, and confined, and consequently with aggravation. The constitution labours under inflammatory fever, often severe. At the outset, active antiphlogistics, locally

and generally, are to be employed—copious leeching, fomentation and poultice, purging and antimony—with the hope of averting suppuration. Failing these, there is no relief to suffering, and no means of averting serious destruction of texture, but by early and free incision. It seems harsh practice to lay a finger open throughout almost its whole extent, on the palmar aspect; but, soon after the infliction of such a wound, pain will rapidly abate, and in a short time the patient will probably be in a deep unconscious slumber. Free outward suppuration takes place; the swelling abates; bones, joints, and tendons are saved; and the finger recovers, tediously it may be, but well. Withhold the incision, and there comes no relief but on the spontaneous evacuation of matter; and then bones are found carious or necrosed, joints are opened into, tendons are sloughing or sloughed; the fingers may recover, in some sense, but are stiff and useless; more frequently, amputation is demanded at an early period.

In both of the more severe forms, extension to the palm is by no means unfrequent. The same principles of treatment are to be fulfilled there as in the finger. But in incising, care must be taken to avoid, if possible, wound of the palmar arch.

Sometimes the virulent form of paronychia is limited to the distal joint of the finger. Then, exfoliation of the corresponding phalanx is extremely probable. But, fortunately, the whole bone seldom comes away; a portion at the articulation remains; and, from this, regeneration may take place, with but little ultimate deformity.

Onychia.

This term denotes a diseased condition of the matrix of the nail; the result of a chronic inflammatory process, inducing intractable ulceration. The first indications of the malady, are pain, swelling, and redness, around the root of the nail; and, on pressure being applied, an ichorous discharge oozes from beneath the cuticle at this part. The nail separates more and more, and is ultimately detached; disclosing an angry ulcer, of irregular margin and tawny surface, surrounded by dusky redness, emitting a thin foetid discharge, and the

seat of intense pain. Usually, an aborted reproduction of the nail protrudes from the upper part of the sore.

The indications of treatment are simple. To pluck away the stunted nail; by an escharotic—as the potassa fusa or nitric acid—to destroy the morbid texture; and, on separation of the slough, to make such application to the sore as its varying state may seem to require. In almost all cases, however, local treatment is not alone sufficient. The general health will be found greatly disordered. Alteratives and tonics are necessary; and, in some cases, a mild mercurial course is followed by the best effects.

Certain cases are very intractable, and to such the term *Onychia maligna* has been applied; inappropriately, however, inasmuch as the sore, however unmanageable, possesses none of the characters of true malignancy. In such cases, the escharotic application must be made with unusual intensity; and if, by this means, a satisfactory granulating surface cannot be obtained, it is well at once to perform amputation of the phalanx. And this summary procedure is still more especially indicated, in those examples of the inveterate form in which the bone has become involved.

Onyxis.

Onychia occurs in both toes and fingers. Onyxis is usually confined to the former. By this term is understood a faulty condition of the margin of the nail; original or secondary; causing, or connected with, an irritable fungous sore of the soft parts. The root of the nail not unfrequently is surrounded by red and swollen integument. The general matrix is sound; but, occasionally, onychia follows on the minor affection, apparently in the relation of effect and cause.

Whether the nail have been originally to blame, or not, it is very plain how important it is, in the treatment, to remove its injurious contact with the angry sore beneath. For this purpose, either mild or rude measures may be employed; the former in the first instance. The nail is softened, and, having been scraped thin, has its edge gradually and gently elevated above the fungous granulations; and then there is interposed a layer of soft lint, or other suitable substance. The

nail having been thus permanently elevated, the freed sore abandons its irritable character, and may be brought to heal under the ordinary applications. But, failing such measures, partial evulsion of the nail is to be had recourse to; a harsh seeming remedy, but very effectual. The nail having been softened and thinned, as before, the blade of strong sharp-pointed scissors is run up from the point to the root; the nail is severed at that part by one stroke; the isolated portion of nail—usually about a quarter of the whole—is then laid hold of by strong dissecting forceps, one blade of which is pushed beneath; and by a sudden wrench evulsion is effected. The pain is great, but momentary. Hot poultice or water-dressing is applied. A healthy character of sore, generally, soon appears; and healing is not long delayed.

Contraction of the Palmar Fascia.

The whole aponeurosis may be rigidly contracted; or a portion only, connected with one or more fingers. When the whole is involved, all the fingers are rigidly bent, and the hand consequently is not only much deformed, but rendered almost entirely useless. The disease is most frequent in those who use the fingers much—as violinists; and is but little amenable to treatment. The partial form I have observed common in those of the better ranks, who are much given to horseback exercise and other field sports. In some of these cases, satisfactory amendment follows subcutaneous division of the affected portion of fascia, the finger being subsequently straightened by the application of a splint and bandage.

Spastic flexion of the thumb not unfrequently occurs during childhood, in connexion with intestinal irritation. It is treated by the application of splint and bandage, while by purgatives and alteratives the primæ viæ are rectified.

Tumours of the Metacarpal Bones and Phalanges.

Exostosis may occur; but is rare. Treatment is seldom if ever required, the affection proving but little troublesome. *Osteo-cystoma* (*Principles*, p. 592,) is more common. Its

treatment depends upon the size. If small, it is punctured by the bistoury ; and, on pressure being subsequently applied, contraction and healing will probably ensue. Or, if need be, a seton is passed and temporarily retained ; and thus the desired obliteration is effected. Those of large size, involving the whole periphery of the bone, warrant amputation of the affected part. *Enchondromata* (*Principles*, p. 585) have here their most frequent site. If small and external, the tumour is dissected off, and the bone left uninjured. Those which affect the whole bone require amputation. Generally, the tumours are not single ; yet usually we are able to save a part—and sometimes the greater part—of that most useful organ, the hand ; the circumstance of the avowed non-malignancy of this tumour admitting of the incisions being made very close to the morbid formation. Sometimes, however, the size and connexions of the tumour are such as to demand amputation of the whole hand. Lately I had occasion to remove one of enormous size, weighing fourteen pounds. From the apex of the tumour repeated and serious hæmorrhage had taken place ; and it was satisfactory to find, on a careful examination after injection, that the blood had escaped from ulcerated openings in large superficial veins, not from any degeneracy in the structure of the tumour itself.

Other Diseases of the Metacarpal Bones and Phalanges.

These bones are especially liable to the inflammatory casualties—ulcer, caries, and necrosis. The ordinary treatment is to be put in force. When, as a last resource, amputation is unavoidable, one general rule should never be forgotten ; viz., that it is our duty to save as much as circumstances will possibly permit—a portion of the original hand being a much better organ of prehension, than any artificial substitute, however ingeniously constructed.

Frequently, in consequence of whitlow, or inflammatory action traumatically induced, it is in our power to retain a finger, but not without complete ankylosis of all its articulations. And, under such circumstances, it comes to be a question whether it were not better to amputate such a member at once, before ankylosis and cicatrization have occur-

red ; thereby not only abbreviating the cure, but also rendering the hand much more useful—especially in the case of the labouring man, by whom a stiff finger is felt to be constantly in the way. I believe that the question is to be answered in the affirmative—in favour of amputation. The thumb, however, is in all circumstances to be preserved, if possible. Rigid or not, it proves extremely serviceable.

Another question arises in the case of a hopelessly diseased metacarpal bone, whose corresponding finger is perfectly sound. May the metacarpal bone be removed alone, or must the finger be taken along with it ? The latter is the preferable practice. The finger left without its metacarpal bone is worse than useless.

Two or even three metacarpal bones, when carious, may be removed, with their corresponding fingers. The operation is preferable to amputation of the whole hand. For the paramount general rule should ever be respected in such cases, of saving as much as possible of the organ of prehension. Lately, in amputating a metacarpal bone, I found its base carious, and also the corresponding portion of the carpal range. The latter diseased part was removed by means of a gouge ; and a most satisfactory cure resulted.

Hypertrophy of the Fingers.

This rare departure from ordinary nature has been occasionally noticed in young people ; affecting one or more fingers ; originating from no assignable exciting cause ; consisting of true hypertrophy of all the textures—bones, joints, tendons, skin, and nails ; and accompanied with more or less deformity, and loss of function. Firm and continued pressure may moderate the unnatural growth. If not, inconvenience may be mitigated by amputation—partial or complete.

Congenital Deformities of the Hand.

Supernumerary fingers are usually attached, not by articulating apparatus, but by ordinary tegumentary tissues. Their amputation is accordingly very easily effected.

Webbed fingers are to be amended, by division of the anormal band ; great care being taken, during cicatrization, to prevent reunion of the opposed parts. And, for this purpose, interposition of dressing is not enough ; it is essential, as in the case of burns here, to make constant and considerable pressure on the angle of union, at the knuckles ; and this is done by means of a piece of cord or tape, placed and retained there.

Club-hand, a condition of the hand analogous to club-foot, occasionally, though rarely occurs. It is remediable, at an early age—with or without the aid of tenotomy—by the wearing of suitable apparatus. And to the machinist, the management of such cases is usually and wisely intrusted. It is also the province of that profession to atone, by mechanical substitutes, for *deficient development* of the hand or fingers.

CHAPTER XXII.

DISEASES OF THE ARTICULATIONS OF THE SUPERIOR EXTREMITY.

Disease of the Shoulder-Joint.

THIS joint, like others, is liable to the ordinary affections of such parts. But it is perhaps especially liable to disorganizing disease, involving all textures ultimately, and usually originating in the cancellated tissue of the head of the humerus. To this, the term *Omalgia* was formerly applied ; very inappropriately, because apparently inferring that the disorder was of the nature of irritation, or neuralgic, not structural and inflammatory. It may occur at any age ; and very frequently its origin is connected with external injury. One of the first and most prominent symptoms is wasting of the deltoid ; ultimately giving a prominence to the acromion. The arm is incapable of exertion ; and pain in the joint is increased by motion, especially when the arm is raised. Bending takes place at the elbow ; and the limb

projects awkwardly from the body, feeble and wasted, and apparently elongated. The shoulder simulates luxation. And, at length, this result may actually occur ; disorganization of the joint having become complete. The constitution does not fail to suffer, in sympathy with the progress of this grave disorder. Swelling, as usual in primary affections of the hard tissues, is of secondary occurrence, and is seldom very great ; evacuation, by external opening, being soon attained by Nature's own effort.

The treatment is to be conducted on the general principles formerly explained, (*Principles*, p. 389.) But, true caries having been established, with an open condition of the joint, it becomes very improbable that spontaneous cure will take place ; and usually the general health is then seriously and obviously on the decline. In such circumstances, the diseased parts must be removed by operation ; by amputation of the limb, or by resection of the joint. The former operation is obviously preferable, when not contra-indicated, (*Principles*, p. 412.)

Resection of the Shoulder-Joint.

To expose the articulation, a flap may be made from the outer and fore-part of the deltoid ; or a single incision may be placed, longitudinally, over the outer aspect of the joint, the knife being entered below the acromion, and pushed at once down to the head of the humerus. In many cases the latter mode is quite sufficient ; and, being less severe, is to be preferred. The knife and finger having penetrated the joint, the remaining portions of the retaining apparatus are divided—more especially the muscles inserted into the tuberosities of the humerus, towards which the finger is the best guide—and the diseased head is then made to show itself, and project through the wound ; the limb being with this view brought forcibly across the thorax. By a saw, abbreviation is made to the required extent. The glenoid cavity is then examined ; and, if found diseased, the affected part is taken away, by means of cross-cutting pliers, or by a gouge. Bleeding having been arrested, the parts are accurately reponed ; the wound is brought together, and the limb is retained steadily

portions appear at or near the cut surfaces, the gouge may be directed against them. Bleeding having been arrested, the wound is brought loosely together, and the limb is secured in a slightly bent posture. Suppuration and granulation follow ; the wound slowly closes ; and an artificial joint by ligamentous structure is ultimately constructed—often of extreme usefulness.

Resection of the Wrist.

It were easy enough to remove by operation the articulating ends of the radius and ulna, and to gouge out the affected parts of the corresponding surfaces of the carpal bones ; but the proceeding is not found to succeed. And, consequently, when this joint is deemed irreclaimable, amputation is preferred.

CHAPTER XXIII.

INJURIES OF THE SUPERIOR EXTREMITY.

FRACTURES.

Fracture of the Clavicle.

THE clavicle is very frequently broken ; and usually by violence applied to the acromial extremity, as by falls on the shoulder. The fracture is generally oblique, and near the centre of the bone. The limb is powerless, the part is pained and swollen, attempted movement aggravates the pain, and the shoulder is both sunk and drawn towards the sternum. Displacement is caused by the falling away of the lower fragment ; whereby the sternal portion is made very prominent, causing palpable deformity, and seeming to be out of place, though truly remaining nearly *in situ*—the action of the pectoral and sterno-mastoid muscles nearly neutralizing each other, and the bone being also steadied by the costo-

clavicular ligament. The acromial portion is dragged downwards by the weight of the arm ; and forwards and inwards by the action of the subclavius—the attachment of this muscle to the first rib being then the fixed point.

The indications of treatment are plain, but unfortunately, not very easily fulfilled. They are to raise the acromial portion to the same level with the sternal ; to retain it there ; and at the same time to keep the shoulder removed from the sternum, so as to prevent the displacement inwards, and consequent “riding” of the ends of the bone. Many and complicated are the means devised for this end. The simplest, most easily obtained, and not the least efficient, is as follows : A wedge-shaped pad is placed in the axilla, sufficiently large to occupy that cavity completely. The best pad is made of horse-hair, covered with soft leather ; but any temporary substitute may be taken at the first dressing. By means of a shawl or large handkerchief, within which it is placed, the pad is securely lodged in the axilla ; and, by tying the ends over the opposite shoulder tightly, elevation of the shoulder, and consequently of the acromial portion of the clavicle, is effected ; and the latter indication is further contributed to, by placing the fore-arm in a short sling, well tightened over the elbow. To maintain extension of the bone is more difficult. Carry a bandage, handkerchief, or other ligature, across the chest—including the lower part of the arm on the injured side—arranging it so that the arm shall be both approximated to the chest, and carried well backwards ; making the humerus a lever, which, acting on the pad as a fulcrum, forces the shoulder outwards. And, if need be, maintain approximation of both scapulæ by means of a figure of 8 bandage, so as to complete and secure the re-adjustment. It is well also to relax the sterno-mastoid by attention to the position of the neck ; for sometimes this muscle would seem to succeed in elevating the sternal portion slightly. Retention will be more easily effected in the erect than in the recumbent posture. The knot over the shoulder may gall the patient ; and, to prevent this, the skin should be well protected by suitable padding. The application of pressure over the site of fracture can be productive only of evil. The integu-

ments may be induced to slough ; and an injury, originally simple, may be rendered compound. In females, for obvious reasons, the treatment is to be conducted with especial care.

Fracture of the Body of the Scapula.

The body of the scapula may be broken across, by violence directly applied. There is but little displacement, or deformity. The part is pained, swollen, and limited in voluntary motion ; and, while movement is made, crepitus can be distinctly felt by the hand placed flatly on the part. In treatment, it is sufficient to restrain motion, by wearing the arm in a sling, and by having a broad flannel bandage passed tightly over the chest, including the fractured bone.

Fracture of the Acromion.

The acromion process may be detached from the spine of the scapula, by direct violence. There are pain, swelling, and loss of power ; and a depression can be felt at the injured part, in consequence of the fractured portion being drawn downwards on the head of the humerus, by the action of the deltoid muscle. At the same time, the clavicle is drawn downwards and forwards on the coracoid process, by the subclavius, and by the action of the deltoid and pectoralis major muscles overcoming that of the trepezius and sterno-cleido-mastoid. Crepitus is not felt on rotating the limb, until the arm has been raised ; for then only can the fractured portions be brought into apposition. In treatment, it is sufficient to raise the arm fully by means of a sling, and to prevent motion by suitable bandaging to the trunk. No pad should be placed in the axilla ; otherwise the hiatus between the fractured portions will probably be increased. Union is generally by ligament.

Fracture of the Coracoid Process.

This injury is also the result of direct violence. The fractured portion is displaced downwards, by the action of the coraco-brachialis, pectoralis minor, and biceps muscles. There

are pain and swelling of the part, with loss of power in the limb ; and crepitation is felt on rotating the limb, after the fore-arm has been flexed and the arm carried across the chest, in order to relax the muscles connected with the process, and so to admit of replacement of the fragment. In treatment, it is sufficient to make this relaxation permanent. The fingers of the injured limb are made to touch the shoulder of the opposite side, and that position is secured by bandaging.

Fracture of the Neck of the Scapula.

This accident—separation of the glenoid cavity and coracoid process from the body of the bone—is the result of great and direct violence, and, like the preceding, is of rare occurrence. Sometimes there is mere separation of the above named parts ; more frequently, the glenoid cavity is fissured and broken up. The detached portion of the scapula is retained in close contact with the head of the humerus, by the long heads of the biceps and triceps muscles ; and both the fragment and the head of the humerus are displaced downwards and forwards into the axilla, by the action of the subscapularis and pectoralis major, and of the other muscles connected with the upper part of the humerus. The appearances are very like those of dislocation ; there is the same flattening of the shoulder, with palpable prominence of the acromion, and vacancy beneath it ; and the head of the bone may be felt plainly in the axilla ; at first, too, there is no crepitation ; and the limb is somewhat lengthened. But, by very gentle effort, the head of the bone may be replaced—a thing very unusual, if not actually impracticable, in dislocation. Then crepitus may be plainly felt, on rotating the arm with one hand, while with the fingers and thumb of the other pressure is made deep in the axilla and on the coracoid process ; then, too, the flattening of the shoulder is made to disappear ; but, on ceasing from the manipulation, deformity and displacement are speedily reproduced. In treatment, a pad having been placed in the axilla, the shoulder is raised and the fore-arm supported by a sling.

Fracture of the Neck of the Humerus.

1. *Fracture at the Anatomical Neck.*—Occasionally the bone gives way at this point, but not so frequently as below the tubercles. The injury is the result of direct violence. The head of the bone remains in its place; while the shaft is carried forwards on the coracoid process, by the action of the muscles inserted into the bicipital ridges. There is little or no flattening of the shoulder; the head of the bone can be felt *in situ*, motionless on rotation; the end of the shaft—directed obliquely upwards and inwards—is felt and seen projecting on the coracoid process; the arm is shortened, with the elbow awkwardly projecting from the side; by slight extension and coaptation adjustment is readily effected, and then crepitus is emitted on rotation. In treatment, a pad is placed in the axilla; by two splints of pasteboard, wood, or leather, placed one on the outside the other on the inside of the limb, retention is secured; the fore-arm is supported by a sling; but the elbow is left free and pendent. Were pressure to be made on the elbow, by adjustment of the sling in the ordinary way, displacement of the lower fragment would inevitably be reproduced; whereas, by following an opposite course, a certain degree of permanent extension is maintained on the humerus, which is of use in preserving apposition.

2. *Fracture at the Surgical Neck.*—This is also the result of direct violence. The upper fragment remains nearly in its place, moved slightly upwards and outwards by the action of the muscles inserted into the tubercles. The upper end of the lower fragment, or shaft, is drawn upwards and close to the side by the muscles inserted into the bicipital ridges; while its lower end, at the elbow, is abducted by the action of the deltoid on its point of insertion. The appearances consequently are—no flattening of the shoulder, on the contrary rather a fulness; the head of the bone felt plainly *in situ*, motionless on rotation; the upper end of the fragmental shaft felt displaced on the side, and a depression plainly perceived at a corresponding point in the external outline of the limb; the arm shortened and powerless; the elbow abducted; crepitus, on rotation after adjustment. In treatment, a full-sized, wedge-shaped pad is placed in the axilla; splints are

applied along the limb, the outer one extending from the top of the shoulder to the external condyle, the inner from the internal condyle to the axilla; the fore-arm is supported by a sling; and again the elbow is left free and pendent.

3. *Fracture with Dislocation.*—Fracture at either neck may occur, in consequence of great and direct violence, and be accompanied with dislocation of the head of the bone. Fortunately, the combination is of exceeding rarity. The symptoms are necessarily complicated. But the diagnostic mark is sufficiently plain; the head of the bone is felt lodged in the axilla, but not moving along with the shaft in rotation. On readjustment, too, the characteristic crepitus may be detected. Treatment is difficult. An effort is to be made, by direct manipulation, to reduce the head of the bone if possible; and if this be accomplished, then the case, having been reduced to one of fracture, requires the ordinary retentive treatment after due coaptation. But, if the luxation remain, notwithstanding every warrantable effort to remove it, then it were well to adjust the end of the shaft into the vacated glenoid cavity, and to retain it there by splints, bandaging, and a pad in the axilla; the broken end becomes rounded off, assuming an articular character and function; and the new joint is likely to prove more useful, than if reunion had been effected with the displaced fragment in the axilla.

Fracture of the Shaft of the Humerus.

1. *Below the Bicipital Ridges, and above the Insertion of the Deltoid.*—Here the position of the fragments is the reverse of what results from solution of continuity at the surgical neck of the bone. The upper fragment is drawn inwards, to the side, by the muscles inserted into the bicipital ridges; while the lower is displaced outwards and upwards by the action of the deltoid, causing an anormal prominence at this part of the arm—immediately above the insertion of the muscle—with an inclination of the elbow to the side. The characteristic signs are, the prominence just spoken of, shortening of the limb, crepitus on adjustment and rotation, and adduction of the elbow. Coaptation having been effected, splints are applied, a pad is arranged so as to keep the upper fragment se-

parate from the chest, the fore-arm is supported, and the whole is steadied and retained by suitable bandaging.

2. *At the Middle of the Shaft.*—At this point the nature of the injury is at once made apparent, by the deformity, shortening, and powerlessness of the limb, with distinct crepitus emitted on the slightest manipulation. Reduction is easily effected, by extension and coaptation; and retention is effected by splints; the fore-arm being also supported by a sling.

3. *At the Shaft above the Condyles.*—Here the solution of continuity is generally oblique; sloping downwards from behind forwards. And the appearances simulate those of dislocation of both bones of the fore-arm backwards. The lower fragment is drawn upwards and backwards by the action of the biceps, triceps, and brachialis anticus. The limb is shortened; and there is much bulging posteriorly. On extending the fore-arm, passively, the deformity is removed; but on resumption of the flexed posture, it is instantly reproduced; and by this test the accident is sufficiently distinguished from dislocation. Crepitus may be plainly perceived, on combining coaptation with rotation. When the line of fracture follows an opposite direction, passing obliquely upwards from behind forwards, the displacement is reversed; the lower end of the upper fragment projecting behind, while the upper end of the lower fragment is drawn upwards in front. Reduction having been effected, rectangular splints are applied on the inside and outside of the limb, and are retained by bandaging; the rectangular position of the fore-arm being obviously advisable, in order to relax the displacing muscles—the biceps, triceps, and brachialis anticus. The splints—best made of pasteboard—should extend from near the middle of the arm quite to the wrist.

Fracture at the Condyles of the Humerus.

1. *Of the Internal Condyle.*—The line of fracture is oblique to the shaft, detaching the internal condyle. During flexion of the fore-arm, there is little or no displacement; but, on extension, the ulna is drawn upwards and backwards, by the action of the triceps, there being no longer any efficient resistance to the coronoid process. The signs are—crepitus, on di-

rect lateral movement of the injured part; obvious displacement of the ulna in extension, and replacement of it by flexion of the fore-arm. In treatment, the limb is arranged in the rectangular position, as for fracture above the condyles. But from time to time it is expedient to undo the apparatus, and practise passive movement of the joint, lest stiffening should occur.

2. *Of the External Condyle.*—There may be little or no displacement in any position of the limb. But crepitus is to be felt; more especially during rotatory movement of the hand and radius. The treatment is as in the preceding case.

Fracture of the Ulna.

1. *Of the Olecranon.*—This may be the result of direct injury, by a fall on the elbow; or of muscular action only, in violent and sudden extension of the limb. Usually, ligament as well as bone is torn; and, consequently, the olecranon, detached from the shaft of the ulna, is displaced upwards by the action of the triceps; leaving a vacant space where prominence should have been, and placing the prominence an inch or more above its ordinary site. Voluntary extension is impracticable; flexion aggravates the signs of the injury. On extending the limb, the displacement is in a great measure removed; the two fragments are brought sufficiently near for satisfactory ligamentous union; and, in treatment, therefore, it is enough to maintain the extended position, by the loose application of a splint on the palmar aspect of the elbow-joint. Very accurate approximation, indeed, is not desirable; a compact ligamentous bond of union being equally serviceable as an osseous one, and much less liable to a second disruption. Likewise, the risk of excessive osseous deposit is avoided, whereby the fragment might become inconveniently ankylosed, on its articulating aspect, with the end of the humerus.

Compound fracture of the olecranon follows direct injury; and is invariably to be regarded as an accident of serious import; inasmuch as intense inflammation of the joint is very likely to supervene. And this tendency to serious evil we should never lose sight of, in treatment; endeavouring to prevent the traumatic arthritis, if possible; when it has occurred,

doing our utmost to avert disorganization. Not unfrequently, with the best care, the joint suppurates, and is with difficulty saved by ankylosis. Sometimes even amputation is demanded.

2. *Of the Coronoid process.*—This rare accident is more likely to follow inordinate muscular action than direct injury. The ulna is displaced backwards, by the unresisted action of the triceps; and the tendon of the biceps is rendered tense and unusually prominent by the bulging forwards of the trochlea of the humerus. The coronoid fragment is drawn upwards by the brachialis anticus. In treatment, the fore-arm is placed in a state of extreme flexion, and retained so by bandaging, so as to relax the displacing brachialis. Ligamentous union is expected, as in the case of the olecranon.

3. *Of the Shaft.*—The weakest point of the shaft of the ulna is a little below its centre; and there fracture is most likely to occur, from violence applied indirectly. The lower fragment is drawn to the radius, by the action of the pronator quadratus muscle; and consequently a depression is made there in the outline of the bones, until obscured by the sanguineous and inflammatory swellings. There is neither pronation nor supination of the hand. By coaptation and rotation, crepitus is readily perceived. In treatment, splints are applied on the palmar and thenal aspects; each splint extending from the elbow to beyond the wrist, so as completely to command the latter articulation, (*Principles*, p. 680.) And, in order to prevent redisplacement by the pronator quadratus, a pad is placed on either aspect of the fractured part, of sufficient size to occupy the interosseous space fully, and so to offer a mechanical obstacle to the undue approximation.

4. *Of the Styloid process.*—This process may be chipped off, without other injury to the bone. There is little indication for treatment other than rest of the part until pain and swelling have subsided.

Fracture of the Radius.

In this injury, it is convenient to observe, as an aid in diagnosis, that there is invariably a marked anormal pronation of

the hand ; whether the bone have suffered alone, or in company with the ulna.

1. *At its Neck.*—This is an accident of rare occurrence, and difficult diagnosis. The fragments are but little displaced, and crepitus has to be detected through a thick cushion of muscular substance. The lower fragment is tilted forwards and inwards slightly, by the action of the biceps ; the upper is rotated somewhat outwards by the supinator radii brevis. Crepitus is to be sought for by firm pressure over the site of suspected fracture, while free rotation is made of the hand and fore-arm. In treatment, the fore-arm is flexed, and placed in the middle state between pronation and supination ; long splints being applied on either aspect of the limb.

2. *Near the Centre.*—The radius very commonly gives way near its centre, from violence indirectly applied, as by falls on the hand, or by twisting of the fore-arm. And sometimes the accident is the result of muscular action alone. The unnatural degree of pronation is very marked and characteristic, the hand hanging awkwardly with the thumb directed downwards. The upper fragment is drawn upwards and inwards, by the action of the biceps ; and there is an apparent enlargement of the upper half, with a diminution of the lower half of the fore-arm. The lower portion of the fractured bone is drawn towards the ulna, as well as completely pronated, by the action of the pronator quadratus. And the supinator radii longus assists powerfully in the displacement towards the ulna, by tilting up the styloid process to which it is attached. In treatment, the fore-arm is flexed, and placed in the middle state between pronation and supination ; the interosseous pads are carefully adjusted ; the long splints are applied on either aspect, projecting beyond the knuckles ; the hand, bandaged separately to prevent congestion, is excluded from the retentive apparatus, and left pendent—so that by its weight it may counteract the displacing tendency of the long supinator, and separate the radius from the ulna at the point of fracture.

3. *At the Distal Extremity.*—This, too, is a very common result of falls on the hand. The radius being mainly concerned in the carpal articulation, to that bone the shock is chiefly and directly conveyed ; and solution of continuity is

extremely probable, more especially if any degree of twisting have been at the same time applied. The line of fracture may be either transverse or oblique. The upper fragment is displaced inwards by the pronator radii quadratus ; causing an abnormal prominence on the palmar aspect, with a corresponding depression on the dorsal. There is pronation ; and, on coaptation and extension, crepitus may be detected. The hand, following displacement of the lower fragment of the radius outwards, leaves the end of the ulna unusually prominent—as if dislocated. Luxation of the carpus, indeed, is in not a few cases closely simulated. The diagnostic marks are—the detection of crepitus, the mobility at the injured part, and the non-continuity of the bone as evinced on rotation. But the case becomes very obscure when the line of fracture is oblique, and *impaction* has occurred, (*Principles*, p. 672.) The lower fragment having received the sharp end of the upper into its cancellated tissue, the two become locked, continuity of the bone is apparently restored, and crepitus is felt but obscurely, if at all. When in doubt, let free extension be made, such as may undo the state of impaction, and then, if fracture exist, the ordinary signs will be evinced. In treatment, it is necessary to be very careful to effect accurate coaptation by reduction ; then to apply the long splints on the thenar and dorsal aspects, securing the wrist and hand against every motion. The fore-arm is placed in the state of easy flexion.

Fracture of both Radius and Ulna.

This is usually the result of direct violence ; and the fractures consequently are at corresponding points—usually near the middle of the fore-arm. By the action of the pronator quadratus the hand is pronated, and the lower fragments are approximated to each other ; they are also drawn upward by the combined action of the extensor and flexor muscles in the fore-arm, and usually project on the dorsal aspect of the limb. On extension and rotation, crepitus may be very plainly perceived. The treatment is, as for single fracture, by long splints and interosseous pads.

In young persons, both bones not unfrequently give way at

their epiphyses ; an accident which closely simulates luxation of the carpus. Like fracture of the radius alone, it is usually the result of indirect violence, by a fall on the hand. The lower fragments, with the carpus, are displaced backwards ; the upper project on the palmar aspect. The latter are kept in close approximation by the pronator quadratus, while the fore-arm is pronated by the pronator radii teres. Considerable power is required, by extension, to undo the locking and displacement ; and then crepitus is emitted on rotation. The hand usually remains in the middle state between pronation and supination. In treatment, coaptation, by efficient extension, having been accomplished, is maintained by long splints, as in the other fractures.

Fracture of the Metacarpal Bones.

The *Carpal* bones are seldom fractured but by great and direct force ; and then the fracture is not only compound, but also generally accompanied with such injury to other parts as to call for amputation. The *Metacarpal* bones, however, not unfrequently give way—simply, and remedially—by force either direct or indirect ; most frequently the latter—as in violent blows delivered on the knuckles. The fragments may be made to ride, by the force which occasioned solution of continuity ; and lateral displacement may be subsequently caused by the action of the interosseous muscles. The swelling, pain, and powerlessness of the limb, with characteristic crepitus on manipulation, are sufficiently indicative of the nature of the injury. Coaptation is effected by extension, and is secured afterwards by splints, extending from above the wrist to beyond the tips of the fingers, on either aspect. Interosseous pads are arranged on each side of the fractured bone, on the dorsal aspect ; on the palmar, one large and suitable pad is placed, to occupy and maintain the hollow of the natural arch of the hand.

In compound injuries of this part, amputation is to be had recourse to with extreme reluctance. And when it is forced on us, let it invariably be as partial and limited as possible, for the obvious reasons formerly stated when treating of amputation on account of disease.

Fracture of the Phalanges.

Fractures of the phalanges are usually compound. But, whether compound or simple, their marks are so plain as to render mistake under any circumstances impossible. When preservation of the injured part is deemed practicable and expedient, reduction is carefully effected ; and coaptation is maintained by slender splints of wood placed on the dorsal and palmar aspects.

DISLOCATIONS.

Dislocation of the Clavicle.

1. *The Sternal Extremity* may be displaced either backwards or forwards. *a. Forwards.*—Dislocation forwards is by much the more frequent ; and results from force applied, indirectly, through the shoulder. The dislodged extremity is seen and felt plainly resting in front of the sternum. Replacement is effected by raising the shoulder, and by carrying it backwards so as to approximate the scapulæ. The treatment is the same as for fracture of the bone, excepting the pad in the axilla, which is here unnecessary. *b. Backwards.*—Dislocation backwards is extremely rare. It has resulted from direct violence applied to the part, and also from the gradual displacement which attends on rotation and curvature of the spinal column. Reduction and retention are plainly to be effected by removing the shoulder from the side ; and this may be done by placing a large pad in the axilla, and binding the lower end of the humerus closely to the side. In an example dependent on spinal curvature, it was found impossible to retain the end of the bone in its proper place ; and the distress occasioned by its backward pressure was so great as to lead to extirpation of the offending part.

2. *The Scapular Extremity* is not unfrequently displaced upwards on the acromion, by falls on the shoulder ; the amount of deformity and inconvenience being proportioned to the degree of laceration of the confining ligaments. The shoulder is depressed ; and the end of the clavicle is seen and felt rising over the spine of the scapula. Reduction is effected by

elevation and retraction of the shoulder ; consequently the same treatment is necessary as for fractured clavicle ; but maintained with unusual accuracy, as well as for an unusual length of time—the bone being very liable to re-displacement, and consolidation of the ligamentous apparatus being apt to prove both tardy and imperfect.

Displacement of the Angle of the Scapula.

Young men, who use the arms violently in their habitual occupations, are liable to this accident. The latissimus dorsi passes beneath instead of over the lower angle of the scapula, causing unseemly projection of this, with pain and loss of function in the limb. Reduction is easily effected by direct manipulation, while the arm is much raised and brought backwards, so as to relax the muscle ; and by bandaging and rest the normal relation may be maintained. On resuming the use of the arm, however, re-displacement is very apt to occur ; a circumstance of the less moment, as, in time, both power and extent of motion are almost completely regained, independently of reduction.

A more serious form of this accident is connected with paralysis of the rhomboid muscles, and occurs in young persons who follow constrained and sedentary avocations. Displacement of the lower angle not only takes place ; but, besides, the base of the bone projects forwards, on moving the shoulder, to such an extent as almost to admit of the hand being placed between the subscapularis and the ribs. In this case, treatment must be mainly constitutional, and directed towards restoration of tone in the faulty muscles.

Dislocation of the Humerus at the Shoulder.

This important accident is more likely to follow indirect than direct violence, as formerly explained, (*Principles*, p. 694.) There are varieties ; three complete luxations, and two partial displacements.

1. *Dislocation downwards, into the axilla*, is the most common—indeed is regarded as the ordinary form of the injury. In addition to the general signs of dislocation, there are the

following:—The shoulder is flattened, the deltoid having sunk inwards; an ample and evident space exists beneath the acromion, which process is unusually and strikingly prominent; the arm is slightly elongated; the elbow is abducted from the side; on elevating the limb, the head of the bone is plainly felt in the axilla,—and it is found to move with the shaft in rotation; motion is greatly abridged, unless when the muscular system is unusally relaxed and flabby; there is no true crepitus; pressure of the bone's head on nerves and veins in the axilla is evinced, by tingling sensations and swelling of the limb; paralysis may follow; not unfrequently the circumflex nerve has been torn across, and permanent paralysis of the deltoid has resulted.

Reduction may be effected, in a variety of ways; pulleys being used, or not, according to circumstances, (*Principles*, p. 699, &c.) *a. By rectangular extension.*—This is the ordinary method; the axis of the extension being intended to relax the deltoid, supra-spinatus, and infra-spinatus muscles, which, according to Sir A. Cooper, are the principal opponents of reduction. And it is well to relax the biceps, also, by slight flexion of the fore-arm; the laque being attached, when required, above the elbow. The patient may be either seated or recumbent; and counter-extension is made by a broad sheet or belt passed round the chest—pressure being at the same time made on the top of the shoulder, so as to fix the scapula more completely. After extension has been duly sustained, (*Principles*, p. 701,) a jerking, coaptating movement is made on the head of the bone, upwards; the humerus being used as a lever. When the patient is seated on a chair, much power in this way is obtained by the knee placed in the axilla, on which the humerus is, as it were, suddenly and forcibly bent. Reduction may take place suddenly and with a snap; or gradually, and without a noise. Then the arm is secured to the side, by bandaging, and retained so for a few days. *b. By extension parallel to the axis of the body, with the heel in the axilla.*—Thus we may succeed, single-handed, in recent, or otherwise favourable cases. The patient is laid recumbent; and the surgeon places himself, sitting, by his side. Taking hold of the hand or wrist of the injured limb, the surgeon makes extension by pulling to-

wards him ; while, placing his unbooted heel in the axilla, on the head of the bone, and pushing from him, counter-extension is made, and at the same time direct reductive force is applied. Care must be taken, however, that the heel's force is neither excessive, nor unduly directed ; for it has happened that, failing to reduce the dislocated humerus, the operator has caused fracture of the ribs. Rupture of the axillary artery, also, with subsequent formation of false aneurism, has been caused by the heel,—booted, and used rashly.

c. By movement upwards.—This is the method of Malgaigne. The shoulder and chest are steadied, while the arm is forcibly raised above the head ; and, if need be, extension is made in that direction, with subsequent manipulation directed against the head of the bone. It is expected, however, that these latter proceedings shall not be required, the bone slipping into its place during the upward movement.

2. *Dislocation forwards, beneath the pectoral muscle.*—The head of the bone is displaced to the inside of the coracoid process, and is locked between that and the clavicle. There is the same flattening of the shoulder, with anormal subacromial space, as in the preceding accident ; but to a greater extent. There is less pain, the axillary plexus being free. Motion is more abridged. The elbow is abducted and thrown back. The head of the bone may be both seen and felt in its anormal site. The arm is somewhat shortened. *In reduction*, the extending force is to be made downwards and backwards, in a line with the body, not in a rectangular direction ; in order to avoid the resistance of the coracoid process.

3. *Backwards on the dorsum of the scapula.*—This is the rarest form of complete luxation of the shoulder. The palpable presence of the head of the bone, in its new locality, is sufficiently diagnostic. Reduction may be effected very simply, by merely elevating the arm, and carrying the hand behind the head. Failing this, the ordinary means are to be employed, as for dislocation downwards.

4. *Subluxation on the coracoid process.*—A partial displacement may take place in this direction. There is slight flattening of the shoulder, with a corresponding degree of vacancy beneath the acromion ; and the head of the bone is

felt and seen projecting on the coracoid process. Reduction is beset with no difficulty. The manipulation required for diagnosis generally succeeds in effecting replacement. The accident is rare.

5. *Subluxation upwards, with displacement of the long head of the biceps.*—The long tendon of this muscle may be displaced from the bicipital groove, and laid over the lesser tubercle. In consequence, the head of the humerus escapes upwards, coming into immediate contact with the acromion. The accident is obscure, and probably very rare. It is noted by loss of power in the biceps, by pain in the seat of displacement, and by the peculiar deformity attendant on the upward subluxation of the head of the bone. Reduction is effected by a coaptating manipulation, directed to the displaced tendon, during flexion of the fore-arm.

Dislocation of the Radius and Ulna at the Elbow.

1. *Backwards.*—Both bones of the fore-arm are not unfrequently displaced backwards, without fracture of any part, by falls on the hand, with the elbow in a state of semi-flexion. The joint is much deformed, and has its motion greatly abridged. The hand and fore-arm are supine; the joint is bent nearly at a right angle, and can be neither completely flexed nor extended. The ulna and radius form a very marked projection posteriorly; and, on examination, the olecranon is found on a higher level than the external condyle of the humerus. The coronoid process of the ulna rests in the cavity which ought to receive the olecranon; and on each side of the olecranon a hollow is caused, by absence of the lower part of the biceps from its wonted locality. The trochlea of the humerus, projecting forwards, forms a hard swelling behind the tendon of the biceps. *Reduction* may be effected in two ways. *a. By extension, with coaptation, from behind.* This is the preferable mode. The patient is placed with his back to the surgeon; and, the chest having been fixed, extension is made with the arm directed completely backwards, in a rectangular relation to the trunk, so as to relax the triceps muscle. Very frequently, in recent cases, the operator thus succeeds, single-handed, by extension alone. With the left hand he

makes counter-extension on the scapula, while with the right he extends from the wrist. In difficult cases, extension is intrusted to assistants, with or without pulleys, while the surgeon conducts the direct coaptating manipulations of the joint. *b. By forcibly bending the joint over the knee.*—The patient having been seated on a chair, the surgeon places his knee in the hollow of the elbow. Pressing the radius and ulna down upon the knee, the coronoid process is freed from the humerus, by separation ; and then, on forcible yet gradual flexion, reduction is effected.

2. *Laterally.*—Both bones may be displaced laterally, as well as backwards, in two ways ; to the inside, or to the outside. *a. Backwards and outwards.*—The coronoid process rests on the back part of the external condyle. The ulna projects more backwards than in the ordinary dislocation. The radius forms a protuberance behind and on the outer side of the elbow, where its head may be felt plainly rotating. The inner condyle projects palpably. *b. Backwards and inwards.*—The external condyle projects. The ulna is prominent posteriorly, resting on the inner condyle, while the head of the radius is placed in the posterior fossa of the humerus. *Reduction*, in either case, may be effected as in the ordinary dislocation.

Dislocation of the Ulna, at the Elbow.

The ulna may be displaced, singly, in two directions. 1. *Backwards.*—The olecranon projects behind. The fore-arm is much twisted inwards, with pronation of the hand. The elbow is bent nearly at right angles, flexion can be but very slightly increased, and extension is quite impracticable. *Reduction* is effected by bending the elbow over the knee, and drawing the fore-arm downwards. The radius proves of use, in this movement, by pushing the external condyle back upon the ulna.

2. *Backwards and inwards.*—The olecranon projects much behind, the coronoid process rests on the inner condyle, and the finger may be placed in the sigmoid cavity. The fore-arm is semiflexed, the hand pronated. Extension may be performed readily by the surgeon, but complete flexion is impracticable. Much pain is experienced, on account of pres-

sure on the ulnar nerve. *Reduction* is effected by direct efforts of coaptation, during powerful and sustained extension. The accident is rare.

Dislocation of the Radius, at the Elbow.

The radius may be displaced, singly, also in two directions.

1. *Forwards*.—The head of the bone rests in the hollow above the external condyle, and may be felt there. The fore-arm is slightly bent, and can be neither completely flexed nor extended. On attempting flexion, the head of the radius is felt to strike against the humerus, abruptly arresting the movement. The hand is inclined to pronation. *Reduction* is effected by grasping the hand firmly, performing supination, and extending the fore-arm steadily.

2. *Backwards*. The head of the radius is displaced behind the external condyle, and to its outside; and in this locality it can be both seen and felt very plainly, especially on extending the limb. *Reduction* is managed as in the preceding accident; but with the hand pronated, not supine.

Dislocation of the Wrist.

1. *Dislocation of the Radius and Ulna*.—These bones may be displaced, together, either on the dorsal or on the palmar aspect of the wrist. Falling on the palm, the two bones are likely to be displaced forwards on the annular ligament; while, from a fall on the back of the hand, the reverse movement is likely to occur. In either case, the signs are plain; a dorsal and a palmar swelling exist, composed either of the carpal bones or of the ends of the radius and ulna, as the case may be; and, by rotation and manipulation, it is ascertained that the continuity of the radius and ulna is unbroken. The accident is rare; fracture of the radius being a much more common result of the same exciting cause. *Reduction* is readily effected, by extension and coaptation. And it is well to maintain retention for some time, by splints, as for fracture of the bones.

Subluxation forwards is by no means an uncommon result of falls on the palm; the bones being not only displaced

towards the palm, but also separated from each other. The nature of the accident is plain, and reduction is easy. But, unless splints be carefully worn for at least a fortnight, deformity by continuance of partial displacement may scarcely be averted.

2. *Dislocation of the Radius, at the Wrist.*—The distal extremity of the radius may be displaced *forwards*, separately; resting on the scaphoid bone and trapezium. The styloid process is no longer situated opposite to the latter bone; and the end of the radius may be both felt and seen projecting on the fore part of the wrist. The hand is twisted. *Reduction* is effected by simple extension and coaptation. Splints are necessary for subsequent retention.

3. *Dislocation of the Ulna.*—Dislocation of the ulna, separately, may take place *backwards*; the end of the bone projecting plainly, with twisting of the hand; and the line of the styloid process showing obvious alteration. Reduction and retention are managed as in the preceding accident.

4. *Dislocation of the Carpus.*—Complete luxation of any of the carpal bones is rare. But subluxation of the os magnum and of the cuneiform bone, is occasionally met with; weakening the joint; and causing projection on the back of the wrist, during flexion. The treatment is by continued pressure and support from without, and by disuse of the part, for some considerable time.

Dislocation of the Fingers.

By falls sustained on the tips of the fingers, dislocation of the phalanges is sometimes produced; and the displacement is usually on the dorsal aspect. It is more common between the first and second phalanges, than between the second and third. The nature of the injury is exceedingly plain; and replacement is effected by extension and coaptation. To render the extension effective, it may be necessary to affix a laque—a piece of tape, or the end of a silk handkerchief, or a riband—to the distal phalanx, by means of the clove-hitch. Splints are expedient for some days after reduction. Compound dislocations almost always are of such severity as to demand immediate amputation.

Dislocation of the Thumb.

The first phalanx is not unfrequently dislocated backwards on the dorsum of the metacarpal bone ; and is reduced, in general, with much difficulty, on account of the strong lateral ligaments, which, stretched, oppose the retrograde movement ; and also on account of the many strong muscles—eight—which are connected with this part, and require to be overcome in the extension. Extension having been maintained for some time, steadily, by means of a suitable laque attached to the first phalanx, flexion is made towards the palm ; and during this forced movement, slowly yet determinedly performed, reduction is usually accomplished. It may be necessary, however, in extreme cases, to have recourse to subcutaneous section of one or other lateral ligament.

CHAPTER XXIV.

INJURIES AND DISEASES OF THE SPINE.

Concussion of the Spinal Cord.

By falls or blows, the spinal cord, like the brain, may sustain a greater or less degree of concussion ; having its functions arrested or disordered, without actual læsion done to its structure. The concussion may be either general or partial. In the latter case, it is probable that the whole cord suffers, though unequally ; the major effect being at and beneath the part struck—as denoted by paralysis, more or less complete, of the parts thence supplied by nerves. This paralysis is transient ; passing off, in a few hours—or days ; never of long duration when simple—that is, when not accompanied or followed by extravasation or effusion. As in the case of the brain, reaction may prove excessive, and the inflammatory process may speedily supervene ; attacking the cord, its membranes, or both, and ushering in a completely new train of symptoms. Or—also as in the case of the brain—the immediate results of the injury may all seem happily to pass away ;

and, at a remote period, an insidious chronic inflammatory process may occur, in the cord or in its membranes ; causing, in the one case thickening with effusion, in the other purulent softening of slow progress.

Treatment is guided by the same principles as in concussion of the brain. Absolute quietude is enjoined ; and the period of reaction is carefully watched. If it threaten to prove excessive, antiphlogistic measures are adopted, according as circumstances may seem to demand. And, for a long period after the receipt of the injury, the patient must be content to use all the precautions of a prudent invalid, so as to avert if possible the insidious and formidable remote results. These, having threatened, are best met by rest and patient counter-irritation—with, perhaps, a cautious use of the bichloride of mercury internally.

Softening of the spinal cord, chronic, insidious, and intractable, is no unfrequent consequence of severe falls, or blows, upon the spine ; more especially in those in the better ranks of life, who have lived hard, and indulged much in venery. The lower limbs first begin to fail, the extensor muscles proving unequal to maintain the erect posture, and the knees consequently ever and anon threatening to give way. The feet are moved oddly, and are not planted on the ground firmly, or with certainty on the spot intended ; the legs are thrown outwards in stepping, and bring the feet down with a slap. The body is stooped in walking ; and the line of progress is seldom a straight one. The bowels get sluggish, and the abdomen enlarges. The urine is voided with difficulty. The arms are found to be weak ; and the fingers seem to be gradually freeing themselves from the control of the will ; there being the same uncertainty and inefficiency in doing any thing with the hands and fingers, as was first observed in the lower extremities. Not unfrequently the patient is much harassed by neuralgic pains, shooting down the back and limbs, and sometimes affecting the head also. Gradually such symptoms increase ; urine and fæces come to be passed involuntarily, or almost so ; the use of the limbs becomes more and more feeble and uncertain ; the brain at last is involved ; the mind grows imbecile, as well as the body ; and the patient dies, often with symptoms of slow compression. The

spinal cord is found more or less affected with ramollissement. I have seen it of the consistence of custard, enclosed in a thickened sheath, out of which it ran fluently. And the membranes of the brain are likely to be much congested, with more or less exudation beneath. But little benefit can be expected from treatment. Of heroic remedies, there is no tolerance. Indeed, the prudent practitioner regards the case as incurable ; and contents himself, by the employment of ordinary and simple means, with palliating symptoms, and delaying the fatal issue.

Compression of the Spinal Cord.

This may be caused, as in the brain, by extravasation of blood, on the surface or in the substance of the cord ; by fracture and displacement of the vertebræ, producing direct pressure on the cord, with or without laceration of its substance ; by inflammatory exudations and effusions exterior to the cord ; or by purulent disorganization of the cord itself, the result of inflammatory action. Very obviously, the direct interference of operative surgery is here of no avail ; the trephine is not to be thought of. The treatment consists of expectant rest, in the first instance ; anxiously looking for the earliest appearance of untoward vascular action ; opposing this by the suitable means, yet not heroically—knowing that in such cases active and extreme depletion is ill borne ; and mitigating the symptoms connected with the paralytic state, as far as the resources of our art will allow. In the case of extravasated blood, if the immediate risk be overpassed, we may reasonably entertain expectation of a fortunate result. But, few cases of displaced fracture are wholly recovered from. And the end of inflammatory disorganization, whether chronic or acute, is almost invariably disastrous.

Fracture of the Spine.

Severe and direct violence is more likely to cause fracture than dislocation of the vertebræ ; these bones being so intimately connected to each other by their articulating processes. The spinous processes alone may be broken. There is then little

displacement ; and the consequences are but trivial. But fracture traversing the body of the bone, making a complete solution of continuity in the spinal column at that part, is fraught with the utmost danger. Structural injury has probably been inflicted, at the same time, on the spinal cord and its membranes ; extravasation of blood has taken place into the canal ; probably there is displacement of the fragments, and further injury thereby done to the soft parts within. Ordinarily, therefore, the most prominent sign of spinal fracture—besides pain, swelling, mobility, crepitus, and departure from normal outline at the injured part—is paralysis of those muscles whose nervous supply proceeds from beneath the seat of injury.

According to the seat of injury, the nature of the case materially varies. When the *lumbar* region has suffered, the more prominent symptoms are, paralysis of the lower limbs, usually with loss of sensation ; involuntary discharge of fæces ; retention of urine ; and, frequently, priapism. When the injury has occurred in the *upper dorsal*, or *lower cervical region*, in addition to these symptoms there are—paralysis of one or both arms, difficulty of breathing, sluggishness of the bowels, with distention of the abdomen. If, again, the fracture be *above the origin of the phrenic nerve*—and compression there prove great—respiration will at once cease, causing death.

An almost invariable result of spinal fracture, wherever situated, is a deteriorated condition of the urinary organs. The kidneys err in their function ; and the lining membrane of the bladder, becoming the seat of chronic congestion, assumes a most depraved action ; copious, fœtid, turbid, ammoniacal urine passes away, with sad aggravation of the general disorder of system. The bowels, too, are not merely distended and sluggish, but become depraved in the function of their mucous membrane ; the dejections evincing a very vitiated character. Bed-sores are apt to form.

The symptoms, continuing and gravescent, may terminate in death ; or, gradually mitigating, recovery may ensue—more or less complete. Obviously, the dangers to life are both many and formidable ; inflammatory action in the cord or membranes,—effusion, exudation, disorganization ; second-

ary affections of the digestive and urinary organs ; bed-sores, and general exhaustion. It need not excite surprise to find the average of recoveries extremely small.

The *treatment* may be reduced to simple principles. Very careful movement of the patient, and adjustment on a hard mattress, lest further displacement of the fragments occur. An equally careful reduction of the displacement which is found to exist. Retention, by adaptation of a splint—of wood, pasteboard, or padded iron—on each side of the spine, for some distance above and below the site of injury. Enforcement of absolute quietude, antiphlogistic regimen, and the other obvious prophylactic measures. Moderate antiphlogistics, should symptoms of over-action exhibit themselves. Mitigation of the unpleasant results, occurring in the digestive and urinary organs ; obtaining regular and better movements of the bowels ; relieving the bladder by the catheter, at stated and frequent intervals ; and rectifying the state of the urine, by mineral acids and the other medicinal means in ordinary use for that purpose. Ultimately—immediate danger having passed by—directing our attention to amending circulation in the paralytic parts ; thus preventing shrinking by atrophy, and perhaps assisting in the recovery of function. The means usually employed to fulfil the last indication are, friction, shampooing, galvanism and electricity, and the use of strychnia. Galvanism and electricity are to be used with caution, however ; it being the opinion of some, that, although by means of these agents, muscular contractility may for a time be roused, yet that the amendment is in general but temporary, and that the parts ultimately lapse into a worse degree of impotency. Counter-irritation is sometimes of service.

In the obviously displaced spinal fracture, with symptoms of compression of the cord, it has been proposed to employ the trephine, with the view of relieving the injured medullary matter. Reason and experience, however, have decided against the procedure ; inquiry having shown that the compressing agent is usually the fore part of the body of the vertebra, which cannot be reached and dealt with from without.

Spinal fissure may occur, without displacement ; and yet

may prove fatal, from another cause than concussion. Into the cleft, a portion of the membranes may be received and retained ; the constriction acts as an uninterrupted exciting cause of inflammatory action, and fatal exudation or structural change ensue. The case is obscure in its course ; and is likely to be unfortunate in its issue, all remedial means proving of little avail to arrest an action which is being ever fed and maintained, by an influence which is inaccessible and consequently insuperable.

Dislocation of the Spine.

Luxation of the spine, without fracture of the processes, is a very rare injury ; yet has occurred, occasionally, in the cervical region—ordinarily between the fifth and sixth vertebræ. It has happened by muscular power alone ; a maniac, for example, having so caused death by, as it were, forcibly throwing his head from him, during restraint in a paroxysm of excitement. More frequently it is the result of violence applied from without ; as by falls on the head. Suspension sometimes causes it, but much more rarely than is generally supposed ; usually there is no displacement of the vertebræ whatever, even in criminal cases—death taking place from other causes.

The displacement is easily recognizable on manipulation ; and the concomitant symptoms of compressed or torn spinal cord are sufficiently explicit. If life, or the hope of life, remain—replacement is to be effected by careful extension and coaptation ; afterwards, untoward results are to be obviated by such management as has been advised in the case of fracture.

Subluxation, or partial displacement, of the vertebræ, is by no means uncommon ; and may take place at any part of the spinal column. It is probably of most frequent occurrence in the dorsal region ; caused by falling on the breech, from a considerable height, with consequent forcible bending of the trunk forwards. The posterior ligamentous apparatus gives way, to a greater or less extent, and a hiatus between the spinous processes results. The symptoms, in addition to the marks of displacement, are those of severe spinal con-

cussion ; and the subsequent dangers are also such as may be expected to follow that accident. By extension, replacement is gently effected. The same retentive apparatus is then applied as for fracture, and must be worn patiently for weeks ; the patient resuming use of his lower limbs very gradually, and not till after many weeks have elapsed. Throughout the whole period of treatment, an anxious regard is paid to the spinal cord ; and remedial measures are adopted, if necessary, to ward off morbid action there.

Lateral Curvature of the Spine.

Lateral curvature of the spine is usually held as contrasted with antero-posterior curvation ; the latter the result of ulcerative læsion in the bodies of the vertebræ, the former originally unconnected with structural change. In the one, there is mere change of position ; in the other, there is change and loss of bone, by the results of inflammatory action which has originated there. It is right to remember, however, that in some cases the antero-posterior curve is found to be of the same nature as the lateral displacement—unconnected with structural change.

Lateral curvation may arise from different causes. And it is important to classify the cases accordingly ; that the suitable treatment may be afforded to each. 1. *Peculiar avocations* are not unfrequently the cause. Those, for example, which entail a habitual use of the right arm, much disproportioned to that of the left ; as in blacksmiths and dragoons. The muscles of the right side become largely developed, and powerful ; and the trapezius and rhomboids, so changed, acting on the spinal column so as to overpower their fellows of the opposite side, have the effect of gradually inducing distortion—it may be to a considerable extent. Of course, this is most likely to occur during adolescence. The remedy is simple ; partial discontinuance of the use of the right side, with increased employment of the left. The displacement, if recent and slight, can be perfectly removed.

2. *Bad habits*, of standing, sitting, or reclining, in an awkward position, are very apt to cause a greater or less amount of lateral distortion in the young. The spinal column is ha-

bitually thrown off its normal line of erection ; and, in course of time, both muscles and bones, becoming accustomed to their anormal position, may refuse to assume any other. And thus curvature, both great and confirmed, may become established, without any actual vice in the skeleton, the muscles, or the general system. Obviously, there is one class of human beings much more than any other exposed to this form of curvature ; namely, young girls occupied in the crowded details of an imprudently burthened course of education. Young people of both sexes are also very liable, who are employed in sedentary occupations in trade ; as in sewing, knitting, engraving, colouring, &c. The indications of treatment are plain ; discontinuance of the hurtful habit or occupation ; ample amount of exercise out of doors ; and a voluntary use of such gymnastic or other exercises as are calculated to produce a healthful play of the general muscular system, and more especially of the muscles of the trunk and spine. And by means of light articles of dress, fashioned and worn so as to attract the patient's notice to the threatened deformity, while at the same time they warn of the negligence or awkwardness which has led to it, disuse of the habits in question may be greatly contributed to. But all cumbrous apparatus—in the shape of stays, or other machinery—are plainly to be avoided, as likely to prove most hurtful.

3. Hitherto we have spoken of simple deformity. Now we have to do with disease. *General Debility*, however induced, in the young, is a very frequent cause of lateral curvature ; insufficient food and clothing, excess of confinement and work, febrile or other affections leaving the system exhausted—are all causes of such debility, with its consequent injurious influence on the spine ; and to these all ranks of life are subject. The muscular system grows especially weak ; the extensors of the trunk are unequal to the task of duly maintaining the erect posture ; and deviation from the straight line results—at first occasional, afterwards habitual, and ultimately confirmed. In the previous examples of lateral curvature—unconnected with actual disease—the curvation begins usually in the dorsal region, and is mainly situated there. But in this case, the beginning of curvation probably takes place in the lumbar region—at the basis of the pyramid

of support. An inclination is made to either side ; then, to atone for that, an opposite curve is made in the dorsal region. And, not unfrequently, there is a third ultimately established in the cervical, in a direction opposed to that of the dorsal. As the amount of bending increases, rotation at the same time generally takes place—the rotation being towards the same side as the curve ; the height of the spinal column, too, greatly decreases ; and, in consequence, serious changes happen to the thoracic and abdominal viscera. The ribs expand on one side, while they are closed on the other ; and they fall inwards, narrowing the chest in its lateral direction, and producing prominence of the sternum and of the costal cartilages. The heart and lungs become incommoded, and labour in their function. The sternum, too—with its costal appendages—has approached unusually near to the pelvis ; the abdominal space is narrowed in consequence, and its organs are injuriously affected. At first, the spinal change is chiefly in the intervertebral spaces ; and the deformity, at that time, is capable of being undone, by appliances from without, or, partially at least, even by the efforts of the patient. But, by and by, the bones become consolidated in their new relation ; interstitial absorption taking place at the compressed points, while corresponding expansion or growth occurs at those which are free ; and then the deformity has become fixed and irremediable—a circumstance of very important and obvious bearing on the question of treatment.

The indications of treatment are directed fully more to the state of the general system than to the part affected. A tonic regimen is patiently persevered in ; at the same time, the deficient extensors are to be roused by friction, and by suitable exercise ; and from time to time, by manipulation, a restoration of the normal outline of the spine is to be attempted. To aid in the fulfilment of the last indication, a light mechanical contrivance may be occasionally employed, restorative yet not oppressive. But all cumbrous or confining apparatus, continuously worn, must prove prejudicial ; the muscles, already weak, will be enfeebled more and more ; and the original malady cannot fail to sustain aggravation. Good diet and clothing ; regulation of the bowels ; exposure to good air ; judicious use of medicinal tonics ; friction of the back, acting more

especially on those muscles which seem most deficient ; healthful exercise, both of the general body, and of the muscles of the trunk—short of fatigue ; and occasional attempts at readjustment by mechanical means—constitute the most important means towards alleviation and cure. Myotomy has been practised, both in this and in other forms of spinal distortion ; but with no good result. The experience and judgment of the profession are now alike opposed to it.

4. *A diseased condition of a muscle or bone, in another part,* may cause curvature of the spine. Thus, a rigid and contracted state of the sterno-cleido-mastoid muscle of one side, producing the state called Torticollis, is very apt to cause spinal curvature, as has already been noticed. The remedy is simple ; by division of the offending muscle. And, again, shortening of a lower limb, by morbus coxarius, or by ill-united fracture—unless atoned for by suitable mechanical contrivance—can scarcely fail to cause more or less distortion of the vertebral column.

5. *Rickets* is certainly not the least common cause. And the curvatures so occasioned are at once the most rapid and decided in their progress, and the least amenable to treatment. The peculiar characteristic is the indication of the ricketty state ;—strumous complexion and character, and distortion of other parts of the skeleton, as well as of the spinal column, (*Principles*, p. 359.) The results of extreme spinal curvature, usually with rotation, are rapidly developed ; and, at the same time, the pelvis and lower limbs, as well as the clavicles and the superior extremities, are more or less distorted. Usually, the direction of the spinal curvature is lateral ; but it may be antero-posterior. The treatment—prophylactic and curative—is such as has been already considered, (*Principles*, p. 360, &c.) It is here that the use of mechanical aids, in the shape of stays and belts, is not only allowable but highly necessary—when the patient is in the erect or semi-erect posture, and especially when exercise is taken ; yet requiring much prudence and skill both in their first adjustment and subsequent use.

Disease of the Bodies of the Vertebrae.

Interstitial absorption frequently occurs, in connexion with simple curvature, as already stated ; whereby a distortion, at first remediable, becomes ultimately confirmed and unalterable. It also occurs as a primary affection, in the bodies of the vertebrae, as a prelude to carious ulceration, (*Principles*, p. 322 and 326.) More rarely, it exists as a separate and distinct disease, causing displacement by incurvation forwards at the affected part ; and deposit, following on absorption, after a time, confirms the curve by consolidation. The treatment is by rest and gentle counter-irritation.

Continuous Absorption, and *Simple Ulceration* occur in the bodies of the vertebrae, as the results of pressure ; the former often is caused by the gradual action of an aneurismal tumour ; the latter may result from the more speedy operation of the same cause, and is sure to be produced by the pressure of an abscess. Healing takes place, on removal of the cause—if that be in our power.

Caries of the Vertebrae is a most formidable affection, and unfortunately not of rare occurrence. It is the ordinary cause sharp antero-posterior curvature ; sometimes attributable in its origin to external injury, but often unconnected with any assignable exciting cause. The morbid action follows the ordinary course, (*Principles*, p. 326 ;) sometimes limited to one or two bones ; often involving almost the whole chain. Its most frequent site is in the dorsal region. Usually it is associated with, and probably dependent on, the strumous diathesis—the cancellated tissue of the bone being, in the first instance, occupied by tubercular deposit. Obscure spinal symptoms generally precede ; pain, uneasiness, numbness, and weakness in the limbs ; spasmodic twitchings ; obstinate bowels ; alkaline urine, with trouble in discharging it. In the part there is dull uneasiness, and ultimately pain, which is increased by pressure, and rendered intense by sharp percussion. The gait is tottering and uncertain ; with the back kept peculiarly rigid, so as to avoid motion of the diseased vertebrae. Often a distressing sense of constriction is felt in the chest, as if this were girded by a tight cord. The symptoms of paralysis manifest themselves gradually ; affecting

different parts, according to the site of the vertebral disease. Sharp curvature, forwards, advances more and more. The matter, in which the carious mass is bathed, accumulates; and, seeking an outlet, points at some part of the surface—directly, on the back; or at some distant point, as in the loins or groin. The ultimate result may be cure by ankylosis, in the slighter cases; the curve remaining permanent. Much more frequently, the issue is fatal; occurring rapidly, by the effects on the spinal cord; or more gradually, by hectic and exhaustion.

The treatment consists in affording absolute rest to the part, by confinement to the recumbent posture; attention to the general health; and judicious perseverance with the highest class of counter-irritants—issues, inflicted by the cautery, actual or potential. In the avowedly strumous cases, however, there is not unfrequently an intolerance of such discharge, which threatens to accelerate the fatal issue by exhaustion; and, in such patients, we are to refrain from all active local treatment; contenting ourselves with rest and general management, looking gloomily to the result. The prone position is held to be preferable to the supine; as relieving the spinal column more thoroughly from the superimposed weight, and proving favourable to venous return from the bodies of the vertebræ. In all cases, mechanical adjustment of the distorted spine is manifestly at variance with both surgery and sense.

Caries of the upper cervical vertebræ requires the most careful management: lest, by sudden motion, displacement should take place, causing fatal compression of the upper part of the cord. The patient seems to be instinctively aware of this hazard; and, on moving his head, always supports the chin carefully on the hand, while the whole body—as a pillar—is made to turn in obedience to the direction of its capital. Here mechanical contrivance is most suitable and necessary; in order to guard against sudden motion, and at the same time to relieve the diseased bones from the weight of the head. By this and counter-irritation, with due attention to the general health, cure by ankylosis is to be sought for. And though in no case our hope need be sanguine, neither in any need it give place to despair; seeing that our museums

show cures by ankylosis under circumstances the most unfavourable—the spinal cord having accommodated itself to even great displacement, as well as loss of substance, affecting the atlas and dentata.

Lumbar and Psoas Abscess.

By *Lumbar Abscess* is understood, a collection of matter pointing somewhere in the lumbar region. It may originate wholly in the soft parts. More frequently it is the result of caries of the vertebræ. Treatment depends on the nature of the case. If there be no prospect of ultimate cure, no opening should be made; the ordinary palliatives are to be administered, and every care is to be taken to keep the integuments entire. If the case present a favourable aspect, on the contrary—the amount of disease in the spine seeming slight, and the system yet tolerably robust—a free evacuation should be made by puncture. By the inflammatory disintegration following on such opening, we are most likely to obtain such a spontaneous change in the state of the bone, as will admit of the healing process, (*Principles*, p. 332.) But the action requires an anxious watchfulness, lest it involve the system in a dangerous amount of disturbance, and lest, also, by excess, it prove prejudicial to the affected part. If a case present itself, in all local respects promising, but with the system accidentally low, the opening must be delayed until, by time and suitable management, the constitutional powers have been somewhat restored, and a tolerance of the remedy regained.

When the matter connected with vertebral disease points in the groin, having descended along the course of the psoas muscle, the affection is termed *Psoas Abscess*; but it, too, may occasionally be found unconnected with disease of bone. The treatment is the same as in the former instance.

Spina Bifida, or Hydrorachitis.

This is a congenital malformation, usually situated in the lumbar region; but it may be in the dorsal or sacral. The posterior part of one or more vertebræ is deficient; and, in

consequence, the membranes of the cord protrude, constituting a tumour of greater or less size—composed of the ordinary integuments, the changed spinal membranes, and the spinal fluid secreted in excess. In other respects, the child may be fully and well formed. More frequently, it is otherwise defective; the lower limbs, more especially, being shrunk and paralytic. Usually the tumour enlarges, by accumulation of the contained fluid; the integument thins and ulcerates; the fluid contents escape and the tumour collapses; an asthenic inflammatory action seizes on the spinal cord and its membranes; and the patient perishes either directly in consequence, or by hectic. In the more favourable cases, the tumour may enlarge but slowly, if at all; and the child's growth may advance uninterruptedly. Sometimes, by spontaneous ulceration, a very minute aperture is formed, through which the fluid contents slowly drain away, the tumour gradually shrinking, and the parts becoming satisfactorily consolidated.

Curative treatment is attempted only in those cases which afford a reasonable prospect of a successful issue. In some cases, it is enough to palliate and prevent increase. In others, we get rid of the swelling, hoping that the fissure in the spinal column may close; or, at all events, that such consolidation shall take place as may effectually prevent recurrence of the protrusion. 1. By steady and uniform support and pressure from without, not only is increase prevented; absorption may also be occasioned; and the tumour having become slowly discussed, an opportunity may be thus given for closure of the vertebral hiatus. 2. Along with the use of pressure, occasional puncturing of the cyst may be practised, so as to expedite the process. 3. The fluid may be at once drawn off with a trocar and canula. 4. By including the prominence of the tumour in two elliptical incisions, which penetrate the whole thickness of its coverings, the fluid is at once evacuated; and then, on bringing and retaining the margins of the wound in contact by means of suture, such a degree and kind of traction is made upon the parts beneath as may favour, very much, the desired closure of the spinal fissure.* This last operation is warrantable only in those cases in which

* DUBOURG. *Gazette Medicale de Paris*. Juillet 31, 1841: and *Brit. and For. Rev.*, No. 24, p. 547.

the fissure is slight, and other circumstances are favourable. And after such a proceeding, as well as in the modes of treatment by puncture, obviously there is much danger by inflammatory seizure of the spinal contents—which has to be guarded against accordingly.

Malignant Disease.

The spinal column has occasionally been found affected by malignant tumour ; * an affection which is fortunately rare, seeing that in all cases it must be quite incurable.

CHAPTER XXV.

INJURIES AND DISEASES OF THE CHEST.

Fracture of the Ribs.

THE ribs are very liable to fracture ; by a blow, or fall, or the application of a crushing weight ; and the ordinary site of the injury is near the middle of the bones. The signs are, pain at the part, usually with discolouration and swelling ; difficult breathing ; full inspiration impracticable—the attempt causing great aggravation of pain, with sudden catching of the breath ; crepitus felt, when the palm is held over the part, during respiratory movement. Displacement is seldom great ; and is almost always inwards. The injury may be compound, with corresponding wound of the integuments. More frequently it is in a manner compound, by wound of both pleuræ, and consequent communication with the lung, the integuments remaining entire. Under such circumstances, emphysema can scarcely fail to occur, to a greater or less extent ; the air escaping outwardly from the lung, and becoming infiltrated into the subcutaneous cellular tissue—puffing

* *Medico-Chirurgical Transact.*, Vol. vi., Art. 6.

up the surface of the chest, and probably also extending to the neck. Inflammatory affection of the pleura is not unlikely to supervene, as can readily be understood.

The objects of treatment are, to effect and maintain replacement, to prevent motion, and to avert inflammatory or other untoward consequences. A compress is laid along the sternum, so as to make that surface equally salient with the spinous ridge of the vertebræ; and then a broad flannel roller is applied very tightly round the chest; the effect of such deligation being to arrest respiratory movement of the ribs, and to force outwards the fragments of the rib or ribs—not only placing them in more accurate contact than they otherwise would be, but also removing their sharp extremities from the pleura, which they might seriously injure. Rigid antiphlogistic regimen is enjoined; and active antiphlogistics are not delayed, if inflammatory accession threaten in the chest. Cough, sneezing, and other involuntary movements of the part, must be avoided, if possible; and confinement to bed is expedient, during the first few days. The bandaging is likely to limit or prevent the emphysema; but if this prove excessive and inconvenient, relief may be obtained by punctures. Ordinarily, it does not occur to a great extent, and gradually disappears, probably by absorption.

Dislocation of the Ribs.

Sometimes, but rarely, the head of the rib is displaced from its connexion with the side of the spinal column, without fracture. The displacement is usually slight. And the injury resembles fracture very closely, both in its history and in its treatment.

Fracture of the Sternum.

The sternum is sometimes broken by direct violence, and displaced inwards. The signs of the injury are plain; deformity by displacement being at once discernible, and crepitus taking place during respiratory movement. The treatment is as for broken ribs; but without any compress over the

broken bone. And there is the same necessity for watchful anxiety as to the state of the thoracic contents.

Caries and Necrosis of the Ribs and Sternum.

These bones are liable to caries and necrosis, in connexion with injury, and as results of mercurial poison—with or without syphilis. The ordinary treatment has to be put in force; except in those cases of chronic caries in which the disease is slight, and has been of very long duration, in a feeble system. Then, sudden suppression of the discharge, by healing, would be very apt to prove injurious; and we content ourselves with mere palliation.

Wounds of the Chest.

These may be inflicted by the thrust of a sharp instrument, by the penetration of obtuse bodies, by gunshot, or by fractured rib. Danger is great, both at once, and secondarily; immediately, by loss of blood, and by entrance of air into the pleural cavity; subsequently, by inflammatory action, and its results. The latter danger is the more serious. And the general statement may safely be made, that in the early treatment, active antiphlogistics are mainly to be trusted to; unless decidedly contra-indicated by special circumstances of the case. Penetrating wounds by sharp instruments, affecting the lungs, are always formidable by bleeding. But, in the case of an obtuse body penetrating, the elasticity of the lung saves that tissue from injury which, from a sharp pointed body, it could not fail to sustain.

1. *Wounds of the Pleura Costalis.*—If the intercostal artery have been wounded, bleeding is likely to be both troublesome and dangerous. The loss may be excessive through the external wound; or blood, accumulating within the pleural cavity, may compress the lung, and constitute a dangerous hæmato-thorax. This point, therefore, should engage our first attention. And to secure the vessel, one of two methods may be adopted. It and its accompanying rib may be included in the noose of a ligature. Or, what is better—a linen bandage having been placed over the part, a fold of

it is pushed into the wound, between the ribs ; and the linen pouch within the pleural cavity is crammed with charpie, by means of a probe or director ; then, tightening the bandage, and securing it firmly round the chest, this internal plug is made to compress the vessel and occlude its orifice. Entrance of air by the wound, and accumulation of it within the chest, are to be avoided by early and accurate closure of the wound. Otherwise, the condition of pneumo-thorax becomes established ; the lung is compressed, and made to collapse ; respiration is consequently rendered imperfect ; and the other lung, having suddenly a great amount of additional duty thrown upon it, labours in its function, becomes dangerously congested, may prove apoplectic, or is attacked by violent inflammatory action. These immediate and most striking dangers having been surpassed, others remain. The wound, suppurating, may lead to inflammatory affection of the pleura or of the lungs, by extension of the inflammatory process ; and this has to be guarded against by antiphlogistic regimen, in the first instance, followed, if need be, by venesection and antimony.

2. *Wounds of both Pleuræ and of the Lung.*—The dangers are still by blood, air, and inflammatory action. There is now a third outlet for the first ; by the bronchial tubes, as well as into the pleural cavity, and through the external wound. And the bleeding, coming from so vascular an organ as the lung, is likely to prove very formidable. The usual signs of wound of the lung are—a state bordering on collapse, difficult breathing, great anxiety of countenance, and expectoration of florid arterial blood. Bleeding is formidable, by direct loss, and by danger of hæmato-thorax ; and also by the risk of accumulation in the bronchial tubes, or in the trachea, during the stage of collapse. Afterwards comes the peril of intense inflammatory action in lung and pleura. And, lastly, by profuse and continued discharge from the suppurating wound, the patient may perish under the symptoms of phthisical hectic. The first danger is met by rest, quietude, and rigid antiphlogistic regimen ; recourse being had also, if need be, to more direct means of controlling the hæmorrhage—derivative venesection, nauseants, acetate of lead and opium, &c., (*Principles*, p. 508.) Rallying and reaction having oc-

curred, antiphlogistics come into use, and often not sparingly. Hectic having threatened or set in, a corresponding change must be made in the treatment. The local management is simple throughout. At first a careful examination of the wound is made, in order that no foreign matter may be permitted to remain. Then it is covered by tepid water-dressing, retained by light bandaging. And the patient is laid, and directed to remain, on the wounded side, in order to favour outward escape of the discharge. Early closure of the wound is seldom if ever desirable. When contusion exists, as in gunshot injuries, great watchfulness is necessary at the time of the separation of sloughs, lest secondary hæmorrhage occur. Small doses of aconite are of use in averting this; by subduing the febrile excitement of the circulation which usually precedes. Emphysema, may occur, in one of two ways; but is seldom such as to require direct treatment. Air, escaping from the pulmonic læsion, may not be wholly discharged externally; or, in a valvular form of external wound, air may enter more readily in inspiration than it can escape during expiration; and, in either case, a portion is liable to be infiltrated into the subcutaneous cellular tissue.

Hæmato-Thorax.

This term denotes an accumulation of blood in the pleural cavity, causing compression of the corresponding lung, and the dangerous consequences of this, already noticed. It may be produced by spontaneous escape of blood, through ulceration; much more frequently it is of traumatic origin—by wound of the lung, or of an intercostal artery. It may be either simple or compound; the latter, if the result of a penetrating wound; the former, if caused by puncture of the lung in a case of fractured rib with much displacement of the sharp ends of the bone—the integument remaining entire. According to the extent of accumulation, respiration is more or less oppressed; there is dulness on percussion on that side, and no respiratory murmur can be heard; on the opposite side, respiration is *puerile*; the patient lies only on the affected side, and the corresponding cheek has often been observed of a purple colour; the coun-

tenance is anxious ; the general surface is cold, pale, and bedewed by clammy sweat ; and there is feeble pulse, with cold extremities, and other signs of serious loss of blood from the circulation.

If the affection be not compound, and slight in other respects, the treatment is analogous to that of sanguineous collections in the external parts of the body, following bruise. Wound of the surface is carefully abstained from ; and gradual disappearance by absorption is patiently awaited. Venesection is always advisable, unless when specially contra-indicated ; first, to arrest the bleeding, and so to limit the amount of accumulation ; secondly, to diminish the amount of circulating fluid in the labouring sound lung, and at the same time to avert or mitigate inflammatory action in all the injured parts. If, however, the amount of accumulation be obviously great—as evidenced by the amount of dulness and fullness of the side, and by the oppression in breathing—it becomes necessary to afford the confined blood an opportunity and means of escape, by the establishment of a suitable opening in the parietes.

In the compound form of the affection, the wound is kept open ; means are taken to arrest the bleeding at its source, and at the same time to assist the respiration ; and inflammatory symptoms are timeously opposed.

Pneumo-Thorax.

This denotes accumulation of air in the pleural cavity. The case may be either medical or surgical ; the latter dependent on wound of the lung ; the former caused by perforating ulceration, connected with tubercular abscess. The traumatic form is the result of penetrating wound, oblique and valvular ; or of fracture of the rib, displaced inwards. It has also resulted from mere bruise of the chest ; the lung and pleura pulmonalis having given way by rupture. Its signs are :—absence of the respiratory murmur on the affected side, with a peculiarly clear resonance on percussion ; the ribs are fixed ; and, on the opposite side, the respiration is puerile, as in the preceding affection. In the medical form, there is usually fluid as well as air in the chest ; consequent-

ly a splashing of this fluid is heard, on succussion; and coughing produces a ringing sound, termed metallic, or amphoric resonance.

The treatment consists in affording ease to the working lung, and averting inflammatory action. Judicious loss of blood, as already seen, conduces powerfully to both objects. In urgent cases, an outward escape is to be afforded to the air, by acu-puncture, or by the thrust of a small trocar and canula.

Emphysema sometimes co-exists with *Pneumo-thorax*. It has been already considered, incidentally.

Paracentesis Thoracis.

Puncture of the thoracic parietes may be required, we have seen, on account of accumulated air or blood in the pleural cavity. It may also be called for, in consequence of fluids having collected there—the result of inflammatory action—*Hydrothorax* and *Empyema*; diseases which belong to the department of the Physician, and which it is consequently unnecessary to consider here. *Empyema* is the affection which most frequently occasions the call for surgical aid. The side is found dull and swollen, and the ribs are unusually separate; there are dyspnœa, difficulty of lying on the sound side, and the other signs of pleural accumulation already noticed; the side enlarges more and more; fluctuation comes to be discernible in the intercostal spaces; and, ultimately, by ulceration at the most prominent part, spontaneous evacuation may take place, as in ordinary abscess.

Serum and air may be sufficiently evacuated by acu-puncture. But for the discharge of purulent and sero-purulent fluids, a more patent opening is necessary; and this is usually made by means of a trocar and canula. This instrument may be employed, subintegumentally, as in the case of chronic abscess, (*Principles*, p. 197.) Or the opening may be made direct, and left patulous and dependent. However made, the margins of the ribs must be carefully avoided—especially the lower—lest wound of the intercostal arteries should occur. In the direct puncture, it is well to make a cautious incision through the skin and muscular stratum,

by means of a scalpel ; merely completing perforation by the trocar. As to the most eligible point for making such a wound, authorities greatly differ. The opening must be dependent, and sufficient in all respects for evacuation ; and yet it must not be so placed as to endanger the diaphragm—though this muscle, it is to be remembered, is usually displaced downwards very considerably by the accumulation. The space between the fifth and sixth ribs is frequently chosen, midway between the spine and sternum. Some prefer that between the seventh and eighth ; others operate between the sixth and seventh. Some go as high as between the fourth and fifth ribs, having observed that natural pointing not unfrequently takes place there. Of late, the space between the sixth and seventh, or that between the seventh and eighth, has been opened, by cautious dissection and the thrust of a small trocar, at the most dependent part—below the lower angle of the scapula. The patient is placed with the side prominent and dependent ; and arrangements are made for turning him on his face, should oppressed respiration ensue. In the case of direct opening, permanency is preferable to closure and re-opening ; and this is secured by suitable dressing of the wound. To favour discharge, the patient remains recumbent on the affected side. If closure be attempted, the greatest care must be taken to avoid the entrance of air ; the canula is withdrawn before all the fluid has escaped ; and the wound is instantly shut up.

CHAPTER XXVI.

AFFECTIONS OF THE MAMMA AND MAMMILLA.

Irritable Mamma.

THE female breast is not unfrequently the seat of irritation ; giving rise to much local uneasiness, and tending also to involve the system in serious disorder. The gland is nowise altered in structure ; sometimes there is slight puffiness in the superficial cellular tissue. The pain is very consider-

able ; not constant, liable to exacerbations—often periodic—and otherwise evincing the ordinary characters of neuralgia. Aggravation generally occurs at the menstrual period. The patient is young or of middle age ; and usually is pale, thin, and cachectic.

The affection is to be considered as symptomatic of more serious disease, and treated accordingly. In the great majority of cases, the uterus is to blame—disordered either in structure or in function ; and until this source of evil be rectified, all other treatment will prove of little or no avail. In cases of functional derangement, the preparations of iron are of great use. Conium is of service in allaying the general irritation of system. Locally, the endermoid use of nitrate of silver, so as merely to blacken, often affords relief ; and belladonna may be used either as ointment or plaster. Change of air, exercise, attention to diet, and the other ordinary correctives of chronic disease, are of great importance. Some cases have been found, dependent on neuromatous formation in the neighbourhood of the gland ; under such circumstances, cure may be readily effected by excision of the superficial tumour.

Mammitis.

1. *Acute.*—Acute inflammatory action in the mamma may result from external injury, exposure to cold, or any of the other excitants of such action ; most commonly it is connected with lactation. The pain and other local signs of inflammatory action are intense ; the fever is proportionally severe ; and suppuration is from the first imminent. The secretion of milk is first perverted, and then arrested. The matter, when formed, is seldom limited to one part, pointing there ; but rather tends to pervade the whole gland, pointing slowly ; and the abscess, after having become open, is liable to degenerate into the condition of sinus.

In the outset, leeches are applied in abundance, with anodyne fomentation ; and the gland is carefully supported by a soft handkerchief or shawl. Repeated doses of sulphate of magnesia, in acidulated solution, assist antimony in subduing the febrile state, and at the same time have the salutary ef-

fect of opposing determination of blood and consequent secretion of milk in the gland. When resolution is to take place, this may be accelerated by very gentle friction around the nipple. When matter has formed, an early evacuation must be made ; for thus only may future severities by incision be prevented. In neglected cases, many sinuses form, communicating with each other ; intersecting the whole gland, and mixed up with intercurrent abscess. Such sinuses do not require to be each incised throughout its whole extent—the knife following mercilessly on the probe ; it is enough to secure satisfactory evacuation by suitable counter-opening, and then by pressure to favour contraction of the cavities. In this we generally succeed ; and continuance of the pressure is further useful, in promoting discussion of the morbid parenchyma in which the sinuses are placed. It may be applied either by bandaging, or—what is better—by careful application of strips of adhesive plaster.

2. *Chronic*.—The mamma is subject to enlargement and induration, by reason of a slow, painless, and very minor amount of the inflammatory process. The whole gland may be affected, or only a part. Young adults are most liable. The swelling is more diffuse than any form of genuine tumour ; and is as little painful, even on manipulation ; it feels as if composed of numerous small granules, and has the negative character of wanting the local and constitutional signs of carcinoma. The treatment consists, locally, of light antiphlogistics, followed perseveringly by discutients ; constitutionally, of attention to the general health, and to the uterine functions, by alteratives, tonics, &c.

Chronic Abscess.

Chronic abscess is not unfrequently found of a somewhat peculiar character in connexion with this gland ; consisting of a firm yet thin cyst, containing a small quantity of thick creamy-looking pus ; existing for months or years, and enlarging very slowly if at all ; situated sometimes in the gland, more frequently beneath it ; firm, because tense, to the touch ; and closely simulating a solid tumour. It may be treated either by subintegumental or by direct puncture ; or,

an error of diagnosis having been committed, and a free incision having been made on the part, the cyst may be dissected away—as if a tumour.

Lacteal Enlargement.

One or more of the lacteal tubes are liable to distension, by occlusion of their orifices ; giving rise to a swelling analogous to ranula in its formation. The contents are milky during lactation ; serous at other times. The swelling has a fluctuating feel, and extends, radius-like, from the nipple outwards ; often it is of a conical form, the apex towards the centre. The treatment is by puncture, near the nipple ; keeping the opening pervious. Should inflammatory action take place, inducing obliteration, the occurrence need not be greatly deplored.

Hypertrophy.

The mamma is liable to hypertrophy, at the period of puberty ; usually with an unsatisfactory state of the menstrual secretion. Sometimes a state resembling nymphomania attends. The undue amount of development may usually be got rid of, by attention to the general health, and to the uterine functions—aided, if need be, locally, by gentle leeching, followed by discussives. Of these latter none are so effectual, locally, as pressure ; and this is very conveniently applied by means of the hydrostatic apparatus of Dr. Arnott.

Pendulous Breast.

The pendulous breast is an affection of advanced years ; being but an exaggeration of the ordinary dug-like condition which this organ so generally assumes, in those who have borne children, and who habitually neglect support of the part in dress. The only warrantable treatment is palliation by suspension and support.

Partial Hypertrophy.

This is the “Chronic mammary tumour” of Cooper. A

portion of the gland undergoes enlargement, with ultimate change of structure—yet simple ; and the enlargement of the lobules takes place usually from the outward surface, constituting a soft unequal tumour. It is peculiar to the young adult, seldom if ever appearing after thirty years of age ; and is almost always connected with disorder of the uterine system. The treatment is the same as for general hypertrophy. Marriage, followed by pregnancy and suckling, sometimes proves a successful means of cure. The tumour, though originally most simple, is liable to degeneration. Consequently, when the ordinary discussive means have failed, after due trial, it should be regarded as other tumours not amenable to discussion. “ Common snakes are killed, because vipers are dangerous.”

Various Tumours.

The gland may be the seat of *Simple sarcoma*. The treatment is first by discussion ; and, if that fail, then by ablation. *Fibrous tumours* have a favourite site here. They are to be removed ; for though less liable to degeneration than any other morbid growth, they are certainly not exempt from that untoward occurrence. *Cystic sarcoma* is very common. Like the simple mammary tumour, it is most frequent under thirty years of age, and prevails chiefly among the better classes. The tumour is composed mainly of serous cysts, the parenchyma consisting of little more than the substance of the gland slightly altered. And there is some reason to believe that these cysts may originate in partial lacteal dilatation. By puncturing the cysts, and the subsequent application of pressure, the tumour may diminish, consolidate, and gradually disappear, in the minor cases. But when the whole gland is involved, extirpation should be at once had recourse to ; not only because other treatment will prove unsuccessful, but because such tumours are well known to be peculiarly prone to degenerate, more especially when irritated. *True Hydatids* are also found in the gland. When single, they may be got rid of by puncture. When numerous, ablation of the part is expedient. *The Malignant tumours* of the mamma are unfortunately of proverbial frequency ; more especially carcino-

ma. The general description of this tumour (*Principles*, p. 552) is not departed from ; the only peculiarity being in the nipple, which, early involved, is remarkably retracted and shrivelled in appearance. The glands of the axilla, too, are liable to be soon affected. The disease is known by the age of the patient, the hardness of the tumour, the character of the pain, the rate and mode of growth, the involvement and retraction of the nipple, the cachectic state of the system as evidenced by the countenance and general appearance. The only cure is by extirpation ; but, as formerly explained, (*Principles*, p. 560) it is only a small number, of the many cases which present themselves to the surgeon, which warrant operation ; and it may be well to repeat here, that if the skin be much involved, if the nipple be much retracted, if there be a marked depression over the tumour, if the open condition be arrived at, if there be adhesion of the tumour to the pectoral muscle or to the ribs, if there be ominous signs of some obscure yet serious disorder proceeding within, and if there be glandular affection without—these, being all singly most unfavourable, and betokening relapse, do most certainly, when coming together, contra-indicate all operative interference.

Extirpation of the Mamma.

The patient having been either seated on a chair, or placed recumbent, the arm on the affected side is raised and held by an assistant, so as to stretch the pectoralis major, and facilitate incision. The knife is entered on the axillary aspect of the tumour, in a line with the mammilla, and is moved in a semi-elliptical direction towards the opposite point ; a similar proceeding is adopted—above or below, as the case may be—to complete the ellipse ; and the size of this space necessarily varies, according to the extent to which the integument seems to be involved, and according to the natural laxity of the parts. It is a fault to take away an undue amount of sound textures, so that difficulty is experienced in effecting and maintaining apposition of the wound ; but it is a worse error to leave tainted parts, by paucity of wound, whereby reproduction of the disease cannot fail speedily to

ensue. It is well to make the lower incision first ; otherwise its course and position are apt to be uncertain, under the irrigation of blood. Then, on each aspect, the knife is sloped through the subcutaneous fat ; and regular dissection is proceeded with from the axilla downwards, dividing the principal vessels and nerves at once, and so rendering the subsequent steps of the operation comparatively bloodless and free from pain, (*Principles*, p. 568.) The diseased mass—with its border of apparently sound tissue, in the case of malignant tumour, (*Principles*, pp. 559, 560,)—having been removed, is carefully examined on every aspect by both sight and touch ; and, if need be, the knife is re-applied where thorough removal is not assuredly apparent. The vessels having been secured, the wound is brought together, and treated in the ordinary way.

Tumours external to the mamma—forming in its immediate vicinity, but not incorporated with it—are by no means uncommon. The simple are removed ; leaving the gland undisturbed. In the case of the avowedly malignant, all is taken away. Of this class of tumours—not in, but near the mamma—the majority are simple, and fibrous.

Affections of the Mammilla.

The mammilla of the male is liable to hypertrophy, and to malignant disease. In the one case discussives are expedient ; the other demands free and early ablation.

The nipple of the female is also liable to hypertrophy and malignant disease. In the former case no direct interference is required ; in the other, there is safety in nothing short of summary ablation—not only of the nipple itself, but of the mamma also. There is one case, however, in which it is unnecessary to sacrifice more than the former ;—when the nipple has been hypertrophied many years, and begins to degenerate in structure. Such degeneration usually commences in, and is at first limited to, the apex ; and, in such a case, to cut at the root of the nipple is to cut in sound parts.

The fissured and excoriated nipple of the nurse is an affection as frequent as distressing. A bare enumeration of alleged cures would occupy much space. Suffice it here to say that the same treatment is necessary as in inflamed and irrit-

able sores, modified by regard to the uses of the part. During application of the child, the nipple is protected by a shield ; and in the interval, some of the many remedies are applied, which are not likely to injure the child, while at the same time they tend to soothe and heal the affected part.

CHAPTER XXVII.

AFFECTIONS OF THE ABDOMEN.

Abscess of the Abdominal Parietes.

ABSCESS of the abdominal parietes sometimes occurs spontaneously ; more frequently, it is the result of external injury ; and, in some systems, but a slight blow may suffice. The site of the abscess is more frequently deep-seated than superficial. At first there is a hard, tender, increasing tumour, which as it enlarges obscurely softens, and slowly becomes obtusely acuminate. The treatment varies according to the stage. At first, while the inflammatory process is but nascent, and the swelling consists of plastic exudation, resolution is in our power, by rest and antiphlogistics. Advancement of the tumour is arrested, and the hard swelling begins to disappear. This subsidence may be accelerated by judiciously used discussives—employed, however, always with the greatest caution, inasmuch as we know by experience that if they be used either too freely or too soon, there is here a great probability of inflammatory reaccession, in an aggravated form. So soon as the formation of matter has been at all indicated, a free evacuating incision should not for an instant be delayed ; it being remembered that the pus is much nearer the peritoneum than the integument, and is moreover bound down by strata of dense fibrous tissue. But it is surely advisable to go a step further ; and, whenever we feel convinced that reasonable hope of arrest and resolution is gone, let us make an incision in the most prominent part of the swelling, where we anticipate that matter is first to form, in order that so soon as it does form it may find a ready drain for its outward escape ;

and so that thereby all the hazards of its pent up accumulation, in any quantity, may be felicitously avoided. If artificial opening be withheld, one of two events is very likely to occur ; the pus, finding its way into the general cavity of the abdomen, excites a most hazardous peritonitis ; or, on spontaneous evacuation taking place, the condition of fæcal fistula is declared—the perforation internally, surrounded by plastic exudation, having penetrated into an adherent fold of intestine.

Tumours of the Abdominal Parietes.

These demand also an early attention, lest, by long continuance and enlargement, they become unfavourably connected with the deepest portion of the parietal layers. The adipose is, perhaps, more common than any other form of tumour in this situation.

Bruise of the Abdomen.

This is always important ; on account of the risk of injury to the abdominal contents ; dangerous hæmorrhage may at once occur by læsion of these, or formidable inflammatory action may be kindled subsequently. And, in treatment, both of these contingencies must be regarded. The most absolute rest and quietude are enjoined ; and the simplest ingesta are given most sparingly. Thus, escape of blood from a torn part is not favoured ; neither is escape of contents from any ruptured viscus promoted—on the contrary. On the first rising of the pulse beyond the limits of moderate reaction, on the accession of increased pain, with vomiting or other sign of disorder of the system—in other words, so soon as there is any indication of inflammatory action being about to occur—the lancet is employed freely, and is followed by calomel and opium, as circumstances may demand. And here the opium may be administered in a larger proportion than usual ; it being the only available opponent of the intense and wearing pain which attends on such action ; and it besides being of good service, in injury of the intestines more especially, by having a sedative effect on the muscular coat of the bowels.

Very obviously, purging is never to be dreamt of, in the early treatment ; when, subsequently, it is necessary to move the bowels, the gentlest remedies are to be selected ; and even they are used with caution.

The first effect of bruise, attended with serious injury of the internal organs, is to produce a very marked state of shock, or depression, in the system. And a very common error in practice is, at once to attempt removal of this. The same evil consequences follow, as in the analogous case of injury done to the cranial contents. Let the patient alone ; and ere reaction, with its quickened and full circulation, occurs, a torn liver or spleen may have had its vessels closed by Nature's hæmostatics, and a ruptured portion of intestine may be so circumstanced by position and exudation, as to render fatal escape of its contents into the peritoneal cavity at least less probable. But, stimulate unwisely ; and then premature reaction is established ; the returning blood finds the mouths of vessels still open, and intestinal extravasation is quite unopposed. In one case, only, are we to interfere ; and that is, when the shock is extreme in both intensity and duration, and threatens to prove directly fatal ; then we stimulate, to save life from immediate loss ; and yet we stimulate very cautiously, lest saving from one hazard we engender another at least as great.

Wounds of the Abdomen.

Wounds penetrating the abdominal parietes, and implicating the viscera within, are necessarily fraught with much danger. From læsion of the liver, a formidable hæmorrhage can hardly fail to occur ; wound of the urinary bladder causes infiltration of the contents, almost invariably fatal ; from wound of the gall-bladder, acrid bile will escape, kindling intense peritonitis ; both acrid extravasation and dangerous loss of blood are likely to follow wound of the kidneys ; wounds of the spleen, like those of the liver, are dangerous mainly on account of the risk of hæmorrhage ; from injured intestines, fæcal extravasation is likely to take place, causing an extent and amount of inflammatory action which is seldom if ever recovered from. Such severe injuries are invariably

attended with a grave amount of shock, which serves the double purpose of warning the attendant of the importance of the case, and giving an opportunity for the completion of Nature's measures for obviating hæmorrhage and extravasation. This state, as formerly observed, is not to be rashly interfered with by the practitioner; its progress is watched; reaction is rather delayed than hastened; and when this, no longer repressible, advances to excess, antiphlogistics are employed actively—as in the case of bruise.

Wound of the Bowel—suspected when discharge of blood by the mouth or by the anus accompanies the ordinary attendant shock—is not necessarily followed by extravasation. A mere puncture is closed by Nature's efforts. The mucous coat is protruded outwards, and plugs the orifice; the abdominal viscera exert a constant equable pressure on each other at every point, and this tends obviously to counteract escape of contents; and these two temporary means of arrest are duly followed by another which is permanent—namely, the exudation of plastic lymph on the exterior of the wound, whereby union of the opposed surfaces of peritoneum, and a safe circumvallation of the injured part, are effected. As in natural hæmostatics, the temporary means are by plug and pressure, the permanent by plastic exudation. A moment's consideration of the nature of this process will explain how mischievous must be an imprudent exhibition of stimuli, or indeed of ingesta of any kind, at the outset of the case.

Protrusion of the Bowel.—If through a penetrating parietal wound a portion of intestine, or other viscus, protrudes entire, it is to be simply replaced; with all gentleness, so as not to endanger an aggravation of inflammatory accession; and yet with all accuracy—the finger following the retreating viscus closely, so as to ensure its being replaced wholly within the abdominal cavity, and thus avoiding the serious risk of obscure strangulation, which is so prone to follow partial reduction. The wound is carefully approximated—by suture, if need be; and by moderate bandaging such pressure is made without, as is calculated to prevent reprotrusion. In subsequent treatment an anxious prophylaxis is maintained, with a preparation for suitable antiphlogistics on the shortest notice.

If the protruded part be found to have sustained mere puncture, it may be simply replaced, as if intact ; trusting to Nature's means of closure. If a larger wound exist—in-cised, of no great extent, and consequently deemed capable of adhesion—it is to be brought accurately together by the glover's suture. (*Principles*, p. 608.) And, in applying this, it is well to turn in the wounded part gently, so that the approximated surfaces shall be peritoneal ; that structure being well known to be much more capable of the required plastic exudation, than are the mucous or middle coats of the bowel. The ends of the suture are cut short, and the part is gently replaced. The desired exudation envelopes the foreign substance, which in time ulcerates its way into the cavity of the bowel, and is thence discharged.

If the portion of bowel be bruised, or otherwise so extensively injured as to render the occurrence of adhesion obviously impossible, it were folly to effect mechanical union and replacement of the part. After such procedure, the wound must necessarily inflame and open, fæculent extravasation is inevitable, and death is almost certain. The wounded part must be retained at the surface ; and, with this view, the peritoneal coat is united with the integument, at the lip of the wound, at one or more points ; and through the upper orifice of the wounded part the fæculent contents discharge themselves innocuously. The condition of *Artificial Anus* is established ; a state of much discomfort, and not altogether devoid of danger ; but infinitely preferable to fatal peritonitis by fæculent escape within the cavity of the abdomen.

Thus, the local treatment differs according to the nature of each case. But in all, the constitutional treatment is the same ; rest and quietude ; starvation ; free venesection on the first onset of over-action ; then calomel and opium—the latter in large doses.

Artificial Anus.

By this term is meant an unnatural outward opening of the intestinal canal, whence fæcal contents are more or less copiously discharged. It may be the result of wound, of abscess and ulceration, or of sloughing consequent on strangu-

lated hernia. By plastic exudation the open portion of bowel is retained in contact with the abdominal parietes ; and the following condition of parts becomes established. The orifice of the upper or gastric portion remains abundantly patent, and not unfrequently troublesome prolapsus of its lining membrane occurs ; the orifice of the lower or rectal portion contracts, is not patulous, and recedes from the external surface ; the two portions have a dense septum interposed between them—composed mainly of the two contiguous portions of the coats of the bowel ; and this becomes more and more solid, and more and more opposed—by projection—to restoration of the normal flow of the intestinal contents. Outwardly, the abdominal parietes are usually distended into a funnel-shaped cavity, whose apex is at the integument, whose base surrounds the intestinal breach, and within whose cavity fæculent matter tends to accumulate, delaying somewhat in its passage outwards. The integumental opening is red, everted, prominent, and surrounded by excoriation.

The dangers and difficulties of such cases depend very much on the site and extent of the intestinal opening. If this be large and near the upper part of the tube, death by inanition can scarcely fail to occur, chyle running so much to waste. If, on the contrary, the opening be in the large bowel, nutrition may be sufficiently maintained, and the result will be one more of annoyance than of danger.

Treatment is in the first instance palliative. Such food is taken as is easily digested ; and the bowels, by diet, and medicine, if need be, are kept “soft and easy.” By external support—by compress and bandage, or by the adaptation of a suitable truss—outward escape from the upper orifice is moderated, if not altogether prevented, and protrusion of the mucous membrane is opposed. And the ordinary means are employed, to obviate excoriation of the surrounding integument. The outer opening may contract and heal, the funnel-shaped cavity may close, and the normal flow may be restored. But much more frequently such is not the case ; and further interference by our art is required. The two main obstacles to cure plainly are—projection of the septum, and retraction and contraction of the lower intestinal orifice. The latter state is to be opposed by the occasional introduction of

tubes or tents, gradually enlarged, whereby the normal calibre may be restored. The septum is to be got rid of, by the gradual process of ulceration ; Dupuytren's forceps being employed for this purpose ;—one blade passed into each orifice, the instrument closed and locked, and the degree of pressure regulated by the screw at the handle. The pressure is at first applied lightly and temporarily ; lest over-action ensue, and the surrounding parts be implicated so as to establish either enteritis or peritonitis. And throughout the whole period of the instrument's use, the effects must be closely watched, lest at any time over-action threaten to occur. By thus gradually destroying the septum—inducing ulceration of it by pressure, and regulating that pressure so that the inflammatory process it creates shall not go beyond ulceration in the part, nor extend thence to the neighbouring textures—by dilating and bringing forward the lower orifice, and by maintaining the external pressure at all times when the forceps and tent are not in use, we hope to restore the normal flow, and effect permanent closure of the aperture. But not only must this use of the forceps be most cautiously conducted ; it must also be most warily begun. Weeks or even months should elapse before it is employed. For, an early application is plainly in favour of the occurrence of the following risks ; a fold of bowel interposed between the two orifices, on account of the septum not being yet fully developed, may be grasped by the instrument, and fatal enteritis may ensue ; or the yet recent, tender, and imperfect adhesions of the bowel to the parietes may be broken up, the former may recede, fæculent extravasation then takes place, and life is soon miserably ended by peritonitis ; or, simply on account of the still unquiet parts having no tolerance of a newly excited action, the immature use of the forceps may be speedily followed by an enteritis ; or the pressure may cause ulceration of an asthenic kind—not attended by plastic exudation around—the abdominal cavity may consequently become exposed, and fæculent extravasation may occur therein.

An artificial anus is sometimes established, designedly, by the surgeon ; when the natural anus is imperforate ; or when, by any cause, the rectum has become insuperably obstructed.

These proceedings will be considered, in connexion with affections of the lower bowel.

Fæcal Fistula.

When an artificial anus has contracted to the condition of sinus, with a papillary orifice through which intestinal contents occasionally escape, it is termed a Fæcal Fistula. A similar state may also result from parietal abscess; whose cavity has opened, by ulceration, into a portion of adherent bowel, either before or after external evacuation. The opening of communication is usually small; the cavity of the abscess contracts; and the condition of fistula is soon established. The methods of treatment are simple. Accurate and firm pressure is applied to the part, so as to prevent fæculent escape, and favour consolidation of the entire track. This may succeed, after patient continuance for some time, along with due attention to the state of the bowels. If it fail, then the actual cautery may be applied, so as by contraction of the burn to obtain closure. And if this do not succeed, then by autoplasty the chasm may be filled up and permanently consolidated.

Abdominal Abscess.

Chronic abscesses are not unfrequently met with in the pelvic region. They may, on the right side, be the result of perityphlitis. More frequently, they are obscure in their origin, and unconnected with any assignable cause. Occasionally, they are connected with perforating disease of the hip-joint. When so far advanced as to render diagnosis no longer doubtful, the ordinary treatment for abscess is to be followed—evacuation, either direct, or valvular and subcutaneous, according as circumstances may indicate. In their nascent state, however, they are—when unconnected with disease of bone—capable of discussion, by means of rest, the internal use of iodide of potassium, and the outward application of the ordinary sorbefacients.

Abdominal Tumours.

This is a wide subject. All the abdominal organs may be the seat of tumour ; and there are aneurisms beside. Detection and discrimination are effected by careful manipulation. Some abdominal tumours are discussible by the ordinary means ; the majority are irremediable. Aneurismal formations are obviously inaccessible to the direct interference of surgery. By general treatment we hope to delay progress, and favour the occurrence of spontaneous cure. (*Principles*, p. 465.)

But *Ovarian Tumours* are those which most attract the attention of the surgeon. They are usually cystic in structure ; may be solitary or not ; multilocular or monolocular ; attached by a narrow peduncle, or by a broad base ; loose or movable ; of small or of enormous dimensions. Those ovarian swellings which are mere serous cysts, are capable of being cured by occasional tapping, by the application of pressure and other discutients, and by general treatment.* But the solid formations, and those which are of the nature of cysto-sarcoma, are not amenable to discussion. They are either to be let alone—surgeon and patient contenting themselves with palliation of their effects ; or they may be dealt with heroically ; attempts may be made at extirpation. The operation is—perhaps unfortunately—sufficiently simple. The patient having been suitably arranged, in a room of elevated temperature, a wound is made through the parietes, of such an extent as may be necessary. There seems no good reason for incising the whole abdomen, in all cases, from the symphysis pubis to the sternum. Let the external incision, here as elsewhere, be proportioned to the bulk and depth of the tumour. The intestines being held aside, the growth is carefully examined ; the attachment is surrounded by ligature, and cut through ; and the parts are then replaced, and the wound approximated.

On the merits of such procedure the opinion of the profession is much divided. At present, we are happy to be able to have it in our power to say, that the preponderance of

* *Lancet*, 1079, p. 179, *et seq.*

weight, if not of numbers, is rather hostile to such operations. There are cases, however, which may certainly render a duly conducted attempt quite warrantable; when the tumour is non-malignant, single, movable, and connected with a narrow peduncle—as may be ascertained by careful manipulation; when the patient is apparently free from other disease; when the effects of this tumour are such as to threaten death by exhaustion at no distant period, unless relief be obtained; when the ordinary discussive treatment, after due persistence, has failed to give relief; and when the patient, having been made fully aware of the risk, is resolved and wishful to undergo the operation. Modern experience has certainly demonstrated, that free incision of the abdomen, with exposure and manipulation of the peritoneum, is a less hazardous procedure than was generally supposed. But the following objections to the ovarian operation must always remain:—deligation of the tumour's attachment is essential; the ligature and what it contains must, by long-continued presence, and acting as foreign bodies, maintain hazardous inflammatory action, which at any time may become excessive and untoward; and, even in prosperous circumstances, the amount of plastic exudation around the ligature must tend to danger, by acting constrictingly on the abdominal contents—even the puckering of the deep cicatrix may induce intestinal obstruction.

It has been proposed to get rid of the cyst of an ovarian encysted tumour by a minor proceeding; making an opening in the abdominal parietes, about an inch and a half in length; puncturing the cyst, and drawing it out as the contents escape; and then cutting off the attachment, after deligation. Such an operation, however, has been found rather less successful than the more direct and open procedure; and certainly it is not more easy of performance.

Paracentesis Abdominis.

Simple tapping of the abdominal cavity is much more feasible than gastrotomy. It is had recourse to, in urgent cases of ascites, and of ovarian dropsy. The former is readily known by characteristic fluctuation being detected—equal

at all parts; but let always great care be employed, so as to guard against deception, inasmuch as dry tapping has been more than once performed. Ovarian disease is distinguished by careful manipulation—which usually shows the swelling not to be uniform as in ascites, but more or less broken up in its outline, as well as of various hardness. Attention is also given to the following points:—In ascites, the fluid always occupies the most dependent parts, while the small intestines correspond to the umbilical region, and the arch of the colon and the stomach occupy the epigastrium. Percussion, therefore, elicits a dull sound over the hypogastric and lumbar regions, and a clear one in the umbilical and gastric; whereas, in encysted dropsy, nowhere does a tympanitic sound exist, the intestines being pushed back by the cyst which is developed anteriorly. Fluctuation, also, is more decided in ascites; and dulness on percussion is more decided in the ovarian affection. Further, “in ascites we find the neck of the uterus in its proper place; in encysted ovarian dropsy the uterus is drawn upwards, so that it is impossible to reach it, while, at the same time, the pelvic cavity is filled by a portion of the abdominal tumour. And in addition to these positive signs it may be stated, that encysted dropsy often exists with a good state of general health, whereas the reverse is the case in ascites; and the latter has generally anasarca of the lower extremities along with it, while the former has not.”* The history of progress also differs; in the ovarian disease, the tumour is at first limited to one side, and thence gradually extends over the abdomen. In ascites the swelling is from the first general. Not unfrequently the two diseases co-exist.

When either or both of these affections have become so far advanced as to interfere with respiration, by pressure on the diaphragm, relief by tapping is usually held to be expedient; if not contra-indicated by the specialties of the case. It is performed thus: The patient having been seated on the side of a bed, or on a chair, has the abdomen tightly girded by a sheet, towel, or bandage; the ends of which are held by two assistants, with directions to pull steadily and firmly as the fluid escapes—so as to maintain equable pressure on the

* CRUVEILHIER.

abdominal contents, and obviate the sudden want of support to these which might otherwise occur, and from which serious hæmorrhage might ensue by the giving way of one or more abdominal veins suddenly deprived of their ordinary support. Or, independently of rupture, alarming syncope might take place, from great or sudden accumulation of blood within the abdominal veins. It is well to ascertain that the bladder is empty. An aperture having been made in the bandage, an incision is made through the skin and fascia by a lancet or scalpel; and then perforation is completed by a large trocar and canula. The trocar having been withdrawn, the canula remains, and through this the fluid escapes; usually serous in ascites, ropy and gelatinous and variously discoloured in the case of ovarian dropsy. Should the flow be interrupted by a fold of intestine, or by other solid matter, coming in contact with and occluding the orifice of the canula, this may be remedied by the introduction of a quill, probe, female catheter, or other instrument suitable for clearing the orifice, and at the same time not calculated to injure the parts with which it may come in contact. Fluid having ceased to come, the canula is withdrawn, the wound is covered by a compress, and the general bandage of the abdomen is drawn tightly and secured.

The point usually selected for the opening, is in the linea alba, about midway between the umbilicus and symphysis pubis. But it may be made in the linea semilunaris, if the bulging of an ovarian cyst render that locality preferable. Sometimes pointing takes place spontaneously at the umbilicus, and the thinned integuments may be scratched through there. Sometimes, also, an old hernial sac invites puncture, at the groin.

CHAPTER XXVIII.

HERNIA.

By Hernia is understood, a protrusion from within an internal cavity, of part of the contents of that cavity. But the

term is usually limited to the most frequent form of such protrusion: namely, that from the cavity of the abdomen. And of this Hernia there are varieties, according to the site of the protrusion: Inguinal and Ventro-inguinale, Femoral, Umbilical, Ventral, Phrenic, Perineal, Vaginal, Labial, Obturatorial, Ischiatic. These, again, may vary according to the anatomical relation of their parts—Congenital, Infantile; and according to the parts protruded—Enterocoele, Epiplocele, Entero-epiplocele, Hernia Litrica. And, further, other varieties depend on the pathological condition of parts—Reducible, Irreducible, Incarcerated, Strangulated.

The *Causes* of Hernia are predisposing and exciting. Whatever weakens the abdominal parietes at any point, predisposes to protrusion at that point;—natural want of closeness of development, as at the groin and navel; rupture of muscle and fascia, at any part, as in parturition; penetrating wound. Again, whatever tends to propel the abdominal contents with unusual force against such weakened or predisposed parts, directly excites or causes the protrusion; as violent coughing, straining at stool, or severe muscular exertion of any kind. And, further, the predisposing and exciting cause may be the same. Cough, straining, or habitual exertion of the abdominal muscles in any way, when long continued, tend to weaken and enlarge the natural outlets of the cavity, by constantly propelling the abdominal contents against the parietes—and thus prove predisposing. And then some sudden cough or strain effects the protrusion, and proves the exciting cause. Hence it is, that old men with coughs and urinary complaints, sailors, gymnasts, &c., are so especially subject to the ordinary forms of this disease.

The *component parts* of the tumour vary according to the nature of the protrusion. But, generally, they may be stated to consist of Coverings, Sac, and Contents.

The *Coverings* are far from uniform; differing in the varieties of Hernia, and being seldom exactly the same in any two cases. In the inguinal and femoral hernia, for example, the coverings differ widely; and in either of these affections, the density, thickness, and even number of the investing layers, depend very much on accidental circumstances. In operation, it is vain to look for an unvarying sameness in this part of

the tumour. In all cases of ordinary hernia, however, there is first the usual integument, and then one or more layers of fasciæ. These will be enumerated, in the separate consideration of the varieties of hernia.

The *Sac* is the portion of parietal peritoneum which is pushed before the protruding viscus, and which forms its immediate envelope. Sometimes it is wanting; as in hernia following directly upon wound, and in the congenital form of the disease. In the great majority of cases, we are to count upon its presence—adherent or not to the extra-abdominal parts with which it is in anormal contact, according to the duration of its presence there, and the liability or not to plastic exudation on its exterior. We ordinarily speak of the neck and body of the sac, as we do of the neck and body of the general tumour; the neck being that portion, of smaller calibre, which is at and near the aperture of protrusion, and the body being understood to be the more globular swelling beyond. If the tumour have been long protruded, without reduction, and otherwise but little altered in its circumstances, the neck of the sac is apt to become dense and unyielding in structure, and the calibre in consequence is at that part of a fixed nature. When, under the application of a fresh exciting cause, a new protrusion takes place, there is a prolongation in the sac, corresponding to the increased bulk of the contents; but, not improbably, the propelled original neck of the sac does not change, except in its position only; and, remaining of its contracted dimensions, it may become the seat of stricture in the case of strangulation—the new neck proving comparatively free and accommodating. This circumstance has obviously an important bearing on the operation for relief of strangulation.

The *Hernial Contents* are various, inasmuch as every abdominal viscus is liable to protrusion; but the most frequently affected, by far, are the intestines and omentum; one or other, or both. If intestine alone is protruded, the tumour is said to be an *Enterocoele*; *Epiplocele* implying descent of omentum; and *Entero-epiplocele*, descent of both. Sometimes only a redundant portion of bowel escapes, in the form of a diverticulum; and this is termed a *Hernia Litrica*.

The *Diagnosis* of hernia is a practical subject obviously of the highest importance. Ordinarily, a hernia is found to be a soft tumour, at the site of an abdominal aperture, receiving an impulse on coughing, and tending to enlargement under exertion of the abdominal muscles in any way, gurgling under pressure if containing bowel, and capable of being replaced, by pressure, within the abdominal cavity. There are certain affections for which such tumours are especially liable to be mistaken. 1. *Hydrocele* simulates the oblique inguinal hernia; but is to be distinguished thus:—Hydrocele is generally more or less translucent, and hernia is almost always opaque; the exception being, when in a large hernia, invested by thin integument, a fold of bowel alone descends, capacious, and filled only with gaseous contents. Hydrocele is a constant tumour, unaffected by pressure; hernia is ever varying by accidental circumstances, and is usually capable of being diminished by pressure, if not made wholly to disappear. The apex of the pyriform swelling, in hydrocele, simulates the neck of the hernia; but, on careful manipulation, it is found to terminate beneath the abdominal outlet, leaving always some part of the cord clear; and the cord is never at any part clear in unreduced hernia. The hydrocele, unless congenital, has no impulse, and evinces no tendency to enlargement, on coughing, or other exertion of the abdominal muscles. The testicle is felt obscurely, if at all, in hydrocele; in scrotal hernia it is usually found, distinct and separate, at the lower part of the scrotum. The history of the case, too, is widely different; the hernial tumour appears suddenly, and proceeds in development from above downwards; the hydrocele is of gradual formation, and its progress is from below upwards. Not unfrequently, however, be it remembered, Hydrocele and Hernia co-exist. 2. *Hydrocele of the Cord*.—This is usually a circumscribed swelling, leaving a portion of the cord clear, above and below, as may be ascertained by careful manipulation; it is not reducible; and it evinces the ordinary negative signs on coughing or other exertion. When the portion of cord within the inguinal canal is affected by circumscribed serous accumulation, however, the diagnosis may become of great difficulty, as can readily be understood—resting mainly on the reducibility or

irreducibility of the tumour. 3. *Cirsocele*.—The ordinary varix of the spermatic veins, and veins of the scrotum, can scarcely be mistaken for hernia; the cord is comparatively clear, the feel of the veins is marked and characteristic. Like hernia, there is diminution of the swelling during recumbency, and on pressure; but, unlike hernia, there is return of swelling, on resumption of the erect posture, and on abdominal exertion, though the thumb be kept accurately and firmly placed on the abdominal outlet. When there is a swelling, however, at the upper part of the cord, partly within the inguinal canal, and consisting of enlarged veins—perhaps with some serous accumulation—diagnosis is difficult; for the form and history of the tumour are very like those of hernia, and there is an impulse on coughing. We trust to the non-reducibility of the swelling, and its characteristic feel; on pinching it, the veins roll like earth-worms between the finger and thumb. This swelling often paves the way for hernial descent. 4. *Bubo*.—The history, progress, form, and feel of bubo must obviously differ very much from those of hernia. The two may be combined, however; a patient afflicted with inguinal hernial, or femoral hernia, may have enlargement of the inguinal glands. 5. *Descent of the Testicle*.—The testicle, descending at an unusually late period, may be arrested in the inguinal canal, causing a painful swelling there very similar to hernia. It is known, by the absence of the testicle in that side of the scrotum, by the feel of the tumour, and by the characteristic pain which is experienced on pressure being made. Like the high form of *Cirsocele*, it may be the precursor of hernia; a portion of bowel or omentum slipping down behind the testicle, through the anormally dilated canal. 6. *Sarcocele*.—This is readily distinguished by the history and progress of the tumour, its feel and form, its negative signs on coughing, and the freedom of the cord—except in some case of malignant disease. 7. *Psoas abscess* is distinguished from femoral hernia; by the evidences of spinal disease, by the history of the case, by the distinct fluctuation in the swelling, and by the progress of “pointing;” and most frequently the site of the abscess is exterior to that of hernial protrusion. 8. *Varix of the femoral vein*.—A bulging varix

of the femoral vein, projecting through the saphenic opening, may very readily be mistaken for femoral hernia. The test is simple. Reduce the swelling by pressure in the recumbent posture, and then press firmly on the abdominal outlet ; if the case be one of hernia, there is no reproduction of tumour ; if it be varix, the swelling quickly reappears.

Reducible Hernia.

At some part of the abdominal parietes, a swelling forms ; painful ; sudden, usually after some unwonted exertion ; at first perhaps slightly tense, and tender ; afterwards soft, compressible, and tolerant of manipulation ; increased by the erect posture and by abdominal exertion—and then, too, sustaining an impulse, when held ; capable of being reduced, by pressure made in the direction of the outlet through which it has come ; often disappearing spontaneously, on recumbency being assumed. An Enterocoele is smooth, elastic, and more or less globular in form ; it gurgles on pressure, and flatulent noises may be emitted spontaneously ; reduction, under pressure, is preceded by gurgling, and is abrupt—taking place *per saltum*. Epiplocele is doughy, and more irregular in form ; it emits no noise ; and reduction is slow and gradual.

The treatment of reducible hernia may be regarded as analogous to that of dislocation ; consisting of prevention, reduction, and retention. Not unfrequently there are premonitory symptoms of protrusion, and then *Prevention* is in our power. Pain and slight fulness appear at an abdominal outlet, after unusual exertion. Hernia is going to form. In order to avert it, the exciting cause is removed, by discontinuance of all abdominal exertion, as much as possible. And the predisposing cause is met, by a well fitted, lightly springed truss being worn on the part, so as to strengthen what is weak in the parietes ; while, at the same time, a mechanical obstacle is directly opposed to protrusion.

Should hernia actually form, replacement, or *Reduction*, cannot be too soon effected ; inasmuch as the parts protruded are ever liable, from apparently but slight causes, to the supervention of strangulation—a state fraught with the utmost

danger to life. To leave a hernia unreduced, and at the same time to continue any laborious avocation, or even to be exposed to but occasional abdominal exertion—is to convert a comparatively unimportant disease into one of the gravest character, and to render a life, otherwise good, dependent on a very slender tenure. In life insurance for example, an applicant affected with a slight but well trussed hernia, is admitted, if in other respects suitable, with but a trifling addition of premium; while he who, with as simple a hernia, and of equally good health in other respects, neither wears a truss, nor otherwise provides against descent, is unhesitatingly rejected.

Reduction is effected by placing the patient recumbent, slightly elevating the trunk, removing all outward pressure from the abdomen, and in short taking every means to relax the abdominal parietes; then gentle and steady retropellent pressure is made with the hand, in the direction whence the descent has come. Such manipulation is termed the *Taxis*.

Retention is effected by continued and suitable pressure at the site of protrusion; and this pressure is best made by means of a truss; a steel spring, with a compressing pad at the extremity. Of these instruments many varieties have been constructed; but, of late, opinion seems to have inclined, very justly, towards a decided preference for the simple spring with its ordinary cork pad; provided that the instrument is accurately adapted to each individual case; the pad fitting nicely to the abdominal outlet, not too conical lest permanency of the dilatation should be so maintained, and yet not so flat as unnecessarily to diffuse the pressure; the spring passing about two inches beneath the crest of the ilium, grasping there firmly, and terminating a little way beyond the spinous processes of the lumbar vertebræ; the spring not so strong as to gall the parts by inordinate pressure, and yet strong enough to effectually shut up the opening; a thigh strap passing from the back part of the spring to the pad, so as to prevent that from being displaced upwards; and, to avoid chafing, a piece of folded lint or linen being interposed beneath the instrument, at the site or sites of pressure. At night, the truss may be removed, on the patient lying down in bed. In the morning it is the first ar-

ticle of dress to be adjusted ; great care being always taken in regard to two points—1. That the pad fits accurately ; and 2. That there is no descent, however slight or partial, during its application. Should at any time reprotrusion occur, the instrument must be instantly removed, and means as instantly taken for replacement and accurate readjustment.

By careful and constant use of the truss, a radical cure is expected in the child. The predisposing cause is permanently removed ; for, descent being prevented, further dilatation of the outlet does not occur ; and, during the general development of structure, the aperture or canal comes to acquire the normal proportion and capabilities. The period during which the truss requires to be worn, for attaining this end, is considerable ; from one to three, or more years. In the case of the adult, so fortunate an issue is not to be hoped for ; the outlet remains dilated, and predisposed to a re-descent, on the application of but a slight exciting cause ; the truss must be worn for life. And yet, a happy incident may occur, in favour of a better issue. Thus, we have seen a phlegmon form under the pressure of a galling pad ; the abscess opened, contracted, and healed ; and, on cicatrization, it was found that the extent and site of plastic exudation had been such as to consolidate the outlet, and render further use of the truss quite unnecessary.

As, in the adult, the truss, however carefully and patiently worn, proves but a palliative, *Radical Cures* have naturally been sought for with some avidity. Of these, several have been applied to the inguinal hernia. What seems the best method is, to adopt the principle of subcutaneous puncture ; making several scarifications in the neck of the sac—the cord carefully protected—and then applying accurate pressure over the canal, so as to favour occlusion of its unoccupied part by plastic exudation. Another method is by invagination ; pushing a fold of integument into the canal, after reduction of the tumour ; retaining the invagination by a suture, at the upper part ; and obtaining afterwards adhesion of the invaginated portion of integument, by pressure, after excoriation by means of ammonia. This, however, is found to be both more uncertain, and more unsafe, than the former

mode. And neither should be attempted, unless in extreme cases, and at the express desire of the patient ; seeing that neither is quite free from risk by excess of inflammatory action.

Irreducible Hernia.

A hernia is said to be irreducible, which cannot be reduced, and is permanently fixed in its extra-abdominal position. This state may be caused, 1. By adhesion of the sac, on its external aspect, to the parts into which it has been protruded ; and by adhesion of its internal surface to the hernial contents. In a neglected hernia of any considerable duration, the former event seldom fails to take place ; and to constitute the second, plastic exudation has only to occur on the opposed surfaces. 2. By the nature of the protrusion. The caput cœcum coli is uncovered by peritoneum posteriorly. It may slide down through the parietes ; and, presenting at the groin, it constitutes an irreducible tumour—as well as a hernia without a sac. The cellular adhesions of the displaced gut have been extended and shifted, but not broken ; and they present an insuperable obstacle to replacement. 3. By contraction of the abdominal cavity. When a large hernia has been long unreduced, it may become permanently irreducible, although no adhesion form between the contents and the sac. The abdominal cavity, having parted with a large proportion of its ordinary contents, contracts upon the remainder ; and then there is found to be no room for a replacement of the extruded parts, even were circumstances quite favourable for such reduction.

Irreducible herniæ are predisposed to evil. The patient usually suffers from flatulence, indigestion, and constipation. The peristaltic movement of the protruded bowels is imperfect, and to other causes of incarceration and strangulation the part is constantly exposed. Such cases, therefore, require to be watched with unusual care. The bowels are to be carefully regulated ; all excitants of intestinal disorder are to be avoided, as well as unnecessary abdominal exertion ; and a bag truss must be constantly worn, so as both to support the protruded parts, and prevent the occurrence of further pro-

trusion. No direct interference is warrantable, with a view to remove the obstacles to reduction. But, should strangulation occur, the ordinary operation is to be performed, for relief of the constriction.

Incarcerated Hernia.

This term denotes a temporary retention of the parts in their anormal position, without obstruction to the fæcal flow, and without the occurrence of inflammatory action. No urgent circumstances call for reduction ; but when this is attempted, it is found to be impracticable under existing circumstances. There may be, 1. An enlargement of the hernial contents. The gaseous contents may have become rarefied ; the fluid and solid contents may have accumulated in unusual quantity ; or a portion of extruded omentum may have slowly expanded by increased deposit of adipose tissue ; and the tumour—thus enlarged—is too bulky to repass the outlet. Or, 2, while the tumour may be but little changed, the aperture through which it came may be temporarily contracted—as much as to prevent replacement, but not so much as to cause constriction and strangulation ; and this state may depend on muscular spasm, or on swelling of the parts connected with one or other of the various stages of an advancing inflammatory process.

The treatment depends plainly on the cause. Gaseous contents are diminished by the continued application of cold ; solid, fluid, and gaseous contents may be favourably acted on by purgatives and enemata ; a fatty omentum may be diminished by pressure and starvation ; and, then, the reduced tumour may be pushed back within the abdomen. Spasm is overcome by the warm bath, opium, or other antispasmodics ; inflammatory exudation is got rid of by antiphlogistics, followed by discutients ; and through the cleared outlet the comparatively unchanged protrusion may again be passed. Until this desirable event can be achieved, the part ought to be supported by a bag-truss, or otherwise ; and every precaution should be taken to avert the occurrence of strangulation—to which such tumours are especially liable.

Strangulated Hernia.

Strangulation is said to have taken place, when the fæcal flow is arrested in the hernial tumour by the tightness of constriction at the neck ; and when, usually from the same cause, circulation has been disturbed in the protruded parts, and the inflammatory process is begun. Or the state may be otherwise defined to be :—incarceration, with interruption to both the fæcal and the vascular flow, and with an inflammatory process in the protruded parts either following or preceding the constriction. For this state of matters, the hernial contents are usually to blame. The constriction may depend on spasm, or other alteration in the abdominal outlet ; but much more frequently it is caused by sudden, or at least rapid and unusual, enlargement of the protruded parts—in consequence of which, the neck of the tumour becomes, as it were, jammed at the aperture of descent. A fresh protrusion takes place ; or fæculent contents accumulate ; or gaseous contents become rarefied ; or an inflammatory process is begun in the protruded parts, causing both engorgement and serous effusion. Much more frequently, however, the inflammatory action is consequent to the constriction—indeed caused by it.

The symptoms of strangulation are very marked. The patient is annoyed by flatulence and general uneasiness. The bowels refuse to act ; the contents of the lower bowel may be evacuated, but no dejection can be obtained from above the seat of stricture ; yet frequently there is a troublesome and urgent desire to go to stool. The tumour is found incapable of reduction ; at first it may be flaccid, but it soon grows tense, and the tension rapidly increases. Pain is felt in the part ; on the increase, and extending towards the abdomen. Sickness comes on, with retching. Then the stomach is emptied ; and, the vomiting continuing, the upper bowels are also evacuated upwards ; the peristaltic movement comes to be wholly reversed, and the vomited matters are stercoraceous. At first, the pulse rose to the sthenic and inflammatory character ; but now it becomes of another type—denoting the state of Constitutional Irritation, and tending fast to lapse into the typhoid character. The tumour becomes more and more tense and painful—perhaps intolerant of even the gentlest

pressure. Great pain affects the whole abdomen, with aggravation and twisting at the umbilicus. The nausea and vomiting continue ; the countenance is anxious, pale, pinched, and wet with clammy perspiration ; there is great restlessness, and distress is constant ; the pulse grows rapid and indistinct ; hiccoughing sets in ; the tumour becomes less intolerant of manipulation, less tense and painful, and feels doughy and crepitant on being handled. Gangrene has taken place. Then the vomiting may cease, and sudden cessation of pain and discomfort may be experienced ; perhaps the bowels act imperfectly ; and the patient may express himself not only relieved but confident of recovery. Sinking, however, continues ; and the fatal issue is not long deferred.

Such is the ordinary course of a strangulated hernia, unrelieved. But there may be another and less formidable termination. In the progress of the case, the integument and other envelopes of the tumour become involved in the inflammatory action ; at first bright red, tense, and very painful ; afterwards darker in hue ; less painful and tense, cold, phlyctenulous—in fact gangrened. The contents are in a similar condition. All slough. And, on separation of the mortified parts, copious fæculent discharge takes place ; relief follows immediately ; the urgency of the symptoms is over ; and gradual recovery may ensue, with the establishment of artificial anus.

In the preceding enumeration of symptoms, we have first the signs of obstruction, and then those of inflammatory action, in the protruded parts. But this may be reversed. The inflammatory process may be the original affection ; caused, perhaps, by a blow—though a less direct and palpable exciting cause may suffice. The tumour is painful and red and swollen, even for some time, while as yet the abdomen is free from ailment, and the bowels are working naturally. But, the perverted vascular action continuing, engorgement with effusion takes place, the bulk of the tumour is increased, in consequence constriction occurs ; and then follow obstruction of the bowels, affection of the abdomen, and aggravation of the local disorder.

The rate of progress varies according to circumstances. When the tumour is small and recent, the constriction is usually

tight ; and, in a few hours, death of the parts, at least, if unrelieved, is certain. Whereas, if the hernia be of some size and long standing, and if obstruction precede the inflammatory action, and neither prove urgent, days may elapse ere much mischief be done, to either part or system. On the average, however, it is not by days but hours, that the registration of time is made in cases of strangulated hernia. And, by the practical man, indeed, minutes are invariably to be regarded as of the most vital importance.

But many if not all of these symptoms may exist, independently of either hernia or strangulation. Whenever they do exist, however, hernia is invariably to be suspected, and the necessary inquiry and examination should be made under all circumstances. There may be no tumour found at the ordinary sites of protrusion, or at any other accessible part of the abdominal parietes ; then it is probable that the symptoms are independent of hernia—purely abdominal. If a hernia is discovered, of old standing and considerable size, not very tense or painful ; if the pain is not greater in the tumour than elsewhere—perhaps not so great ; if the bowels are acting, though perhaps imperfectly ; if, on inquiry, it is ascertained that the abdominal and general symptoms plainly, and by some considerable time, preceded the change in the tumour ;—then the probability is, that the affection is enteritic or peritonitic—as may be—originating in the general abdomen, affecting the tumour secondarily, and perhaps even in a minor degree. When, however, the signs of strangulation are found marked and acute, and the history plainly indicates the precedence of the local and extra-abdominal signs of disorder, there need be no doubt that the case is of the ordinary kind—the urgency essentially dependent on strangulation of the hernia.

The *Treatment* of strangulated hernia necessarily varies according to the nature of the case. In general, it may be said that our object is to effect reduction as speedily as possible ; saving structure, by favouring decline of the inflammatory process ; restoring the normal passage of the intestinal contents ; and arresting the disastrous progress of the constitutional disturbance. But it is not always good practice to have recourse to the manipulations for reduction immediately ; and,

in regard to this practical point, the cases may be divided into two great classes ; those which are preceded by inflammatory action in the hernia, and those in which this action follows on the constriction otherwise produced. The latter, doubtless, are the majority. In the former, it is the natural and proper course of procedure, to remove the cause of constriction, if possible, in the first instance ; leeches are applied, and the other suitable antiphlogistics are enforced ; and when, by such means, the bulk of the tumour has diminished, and the parts have also acquired a better tolerance of manipulation, then the reductive pressure is to be applied—without risk of doing harm, and with a good prospect of proving successful. The inflammatory action has caused the constriction ; remove the cause, and the constriction is easily dealt with. But, in the other class of cases, the state of matters is reversed. The constriction has caused the inflammatory action ; and, only after removal of the former, can we expect to cope at all successfully with the latter.

In employing leeches for the relief of hernia, it is well not to apply them to the tumour itself, but to its immediate vicinity ; otherwise, the slipperiness which is produced, by oozing of blood, may interfere seriously with the manipulations of the taxis.

In applying the taxis, the patient is placed recumbent, and with the limbs and trunk so arranged as to relax the abdominal parietes to the full ; it is well also to see that the bladder is empty, and that no bandage, belt, or other constriction is affecting the abdomen. The tumour is then grasped with the hands, firmly yet cautiously ; and while with one hand general pressure is made on the bulk and body of the tumour—forcing it in upon itself as it were, and at the same time pushing it back in the direction whence it has been protruded—a kneading or pinching movement is made on the neck of the tumour by the fingers of the other hand, so as to disentangle and free the part most impacted and compressed. And this is steadily persevered in, for some time, provided the patient do not complain greatly of aggravation of the pain and general uneasiness. Our wish is, to push the hernial contents back, not in mass, but in detail ; those going first which were last protruded. The patient is kept in conversation, to pre-

vent him from straining his abdominal muscles, in involuntary opposition to the operator. There is energy, yet no violence of force in the pressure ; and it is patiently and steadily maintained, yet not continued too long—that is, not after reasonable hope of its success has passed, and when its maintenance must inevitably tend to serious aggravation of the crescent inflammatory action. Sometimes it is not applicable at all ; when, for example, the case is acute, and has made great progress ere assistance is called ; when the parts are so obviously intolerant of pressure, as to convey to the practised mind the apprehension of the textures giving way by rupture under an attempted taxis ; also, when we are satisfied that the inflammatory action has already gone so far as to render loss of substance, either by ulceration or by sloughing, inevitable in the constricted parts.

Sometimes benefit accrues from an opposite direction of gentle force, previous to the reductive application of it ; bringing down the jammed neck from the abdominal aperture, and so favouring a clearance of the passage by an unravelling, as it were, of its contents ; causing, in fact, a slight increase of the descent, before the whole is attempted to be replaced. A bluff forcing of the fundus of the tumour on its neck is especially to be avoided, when replacement is intended ; for the effect of this, in the case of protruded bowel, is not only to jam the parts yet more, but actually to favour formidable accession to the tumour's bulk by traction from the aperture downwards.

Failing in the well applied taxis, we naturally look for *Auxiliaries* to it ; and we find a catalogue of these, analogous to the aids of reduction in dislocations. Some act on the contents of the tumour, tending to reduce bulk ; others affect the abdominal outlet, tending to enlarge space ; and the latter act well, not only in those cases in which spasm of the abdominal parietes is the cause of constriction, but also in those in which the abdominal outlet may be of the ordinary dimensions, yet quite unfit for return of the impacted textures which it happens to contain ; in other words, they are of use in relaxing muscular fibre, not only in a spastic but also in a normal state—making easy room, either way, for replacement of the dislocated parts. And here it may be stated, that

though in most cases the abdominal outlet is in the first instance free from change, and constriction depends on alteration in the contents ; yet, strangulation having occurred, the abdominal parietes at the site of the hernia become involved in the perverted action, and sooner or later are irritated into spasm. And hence it is, that the most useful of the auxiliaries are such as tend to abdominal relaxation.

1. *Venesection* is advisable in but a few cases ;—in the comparatively young and robust, of inflammatory tendency, tolerant of loss of blood ; with a tight strangulation yet recent, marked signs of advancing acute action in the parts, and the constitutional symptoms still evincing the sthenic type. In such cases, blood-letting—one copious and rapid abstraction, from the arm—is of use, by both combating this advancing action, and at the same time tending to cause complete prostration of the muscular system—the abdominal parietes of course included. 2. The *Warm bath* has similar tendencies ; and is obviously more generally applicable, being of a temporarily depressing power ; gaining the desired end, yet saving the system from spoliation. If there be time, this is one of the best means of assisting the taxis. The patient is placed recumbent in the bath, with the abdominal parietes relaxed by posture ; and, when faintness is beginning to be complained of, the taxis is resolutely repeated. It may fail ; but the opportunity by the bath is not yet over. Let the patient be replaced in bed ; in a few minutes he will be found deluged in perspiration, with a muscular system more prostrate than before ; and then the taxis is most likely to succeed. 3. *Fomentation* is inapplicable ; by rarefying the gaseous contents, and favouring exudation, it increases the bulk of the tumour ; and it is too feeble and limited in its relaxing effect, to act favourably on the abdomen. 4. *Antimony*, as a nauseant and prostrating agent, is very inferior to the bath ; adding greatly, and in a dangerous degree, to the irritability of stomach, and to the downward tendency of the constitutional symptoms. It is inapplicable. 5. And, for a like reason, let *Tobacco* be used very warily, if at all. By other, less hazardous, and more manageable auxiliaries, our object may be as speedily obtained. 6. *Opium* is deservedly in much higher repute ; following blood-letting in the

marked cases of an inflammatory nature, given singly in others ; the dose a full one, not less than one grain. The beneficial effect is twofold. Constitutionally, the system is rendered more tolerant of the depressing effects of the strangulation ; the remedy being in fact equally useful here as in the case of intense abdominal inflammation unconnected with hernia. Locally, very great service is obtained by muscular prostration, so soon as the full narcotic effects of the drug have been established. This requires time, however ; and consequently opium, like the warm bath, is not applicable to all cases—at least as an auxiliary of the taxis ; for, in all, there is not time to await the operation of the remedy. 7. *Purgatives* are in all cases of strangulation most unwarrantable. The bowel is locked ; and the stimulus of purging, quite unable to undo the locking, acts but injuriously, in applying a stimulus which cannot be obeyed, and aggravating an already crescent inflammatory action. In the case of incarceration, the wary use of purgatives is often very serviceable, in unloading the protruded bowel ; but in the tighter degree of constriction, causing strangulation, they are never to be thought of. 8. *Enemata*, however, have a different character. When simple and bland, however freely and largely administered, they have none of the pernicious properties of purgatives—more especially of those which are drastic and given by the mouth. Besides, they are positively of use, by disburthening the lower bowels of their contents, both solid and gaseous ; and so making room within the abdominal cavity for reception of the extruded parts. And experiment would also lead us to suppose that they have a mechanical tendency to extricate, by exciting traction, from within, on the constricted and protruded bowel.* 9. The *Rectum-tube* is also both safe and useful, when passed high and cautiously, so as to reach the colon ; the object being to evacuate the gaseous contents of the lower bowels more thoroughly than enemata can do, and so to make room within the abdomen. But, obviously, such a proceeding is only applicable to those cases in which distention of the lower bowel is indicated or likely. 10. Some auxiliaries affect the tumour mainly. Certain cases, we have already seen, render it ne-

* *Lancet*, 1035, p. 468.

cessary that local blood-letting should precede the taxis. Fomentation has been thought of, but is found worse than useless. The *application of Cold* is sometimes of the greatest service. Applied indiscriminately, it will do harm ; but limit its use to those cases which are chronic in their progress, in which the signs of obstruction plainly precede those of inflammatory action, and in which the inflammatory process affecting the tumour is not only slight but scarcely begun—then the effect is most favourable. The gaseous contents being condensed, bulk is diminished ; muscular energy is probably somewhat lowered, and space is gained ; and, perhaps, by the puckering of the investments of the tumour, some little reductive pressure may be so exerted. But act as it may, there is no doubt that the local application of cold tends wonderfully to assist the taxis, in the class of cases just described. It is best applied by sprinkling the tumour and surrounding parts with æther, and keeping up a continuously rapid evaporation by directing a current of air upon the part. Should this fail, great care must be taken not to apply heat suddenly to the part, by fomentation or bath, or otherwise to cause rapid exaltation of temperature, for very obvious reasons. 11. *Acupuncture* has been proposed, when the constricted bowel is obviously distended by gaseous contents. But the use of cold is likely to obtain the same end, as effectually, and more safely. 12. *Posture* may be rather considered as a part of the taxis, than as any thing auxiliary to it ; so invariably is it to be attended to. It necessarily varies, in details, according to the site of the protrusion. Its object is ever the same ; to relax the parts through which reduction has to be made. In hernia at the groin, it has sometimes been thought that elevation of the feet, with a hanging position of the recumbent body, has been of use in exerting an extricating traction on the strictured parts.

The most available, and most generally used of these auxiliaries are :—blood-letting—local in all the inflammatory cases, and general in the few examples which admit of it ; the warm bath ; opium ; simple enemata, in large quantity ; perhaps the long tube ; in the chronic and uninflamed cases, always the local application of cold. If the taxis is to succeed, a yielding of the tumour is felt beneath the hands, the

contents are plainly shifting ; then a gurgling noise is heard, denoting replacement of the gaseous contents—always a welcome sound ; and speedily thereafter the solid matters recede, sometimes very gradually, more frequently as it were *per saltum*. A truss, or suitable compress and bandage, is instantly applied ; the patient is confined to bed, recumbent ; antiphlogistic regimen is strictly enforced ; after some hours, an enema may be given, if the bowels have not acted spontaneously ; but not till after many hours should even the simplest purge be given by the mouth, it being now well ascertained that the loop of bowel included in the stricture remains long in a paralytic state, and incapable of obeying the peristaltic stimulus. There is, in short, the same serious objection to purgatives immediately after reduction, as during the existence of strangulation. Should peritonitic or enteritic symptoms threaten, the usual antiphlogistic treatment must be had recourse to, both early and with energy. Not unfrequently, after tight constriction, discharge of blood takes place *per anum* ; this doubtless being furnished by the mucous coat of the lately strangled part.

It may happen that under a forcible application of the taxis, in a recent hernia, the tumour recedes suddenly, in mass. This is not desirable. For, it is not improbable that the untoward symptoms may continue, quite unchanged ; the reason being, that the sac and its contents have been reduced together, with their relations unaltered ; the neck of the sac continuing to constrict the omentum or bowel, as before. In such a case, treatment becomes very embarrassed. Most surgeons are of opinion that we are required to expose the abdominal outlet by operation, in search of the yet strangulated bowel ; aiding that search by making the patient cough, or otherwise exert himself, so as to favour re-descent of the hernia.

The operation for strangulated hernia is unhesitatingly to be had recourse to, so soon as the taxis, with such auxiliary means as seem advisable, has been fairly tried, without success. The great majority of experienced surgeons agree, that in regard to this operation, error is more frequent on the side of delay than of precipitancy. Two circumstances demand its instant performance ; a conviction that by no other means,

than by the edge of the knife directly applied, can the abdominal outlet be so enlarged as to relieve constriction and admit of replacement ; also, a conviction that already the inflammatory action has advanced so far, that either ulceration or sloughing is inevitable in the protruded parts. In the one case, we operate to relieve the stricture and effect replacement, hoping to arrest inflammatory action; in the other, we operate to relieve the stricture, and, leaving the hernia unreduced, prevent fatal extravasation of intestinal contents within the abdomen—hoping also to limit the inflammatory action to the directly implicated parts. The danger of strangulation is twofold ; typhoid disturbance of the system, and untoward inflammatory progress in the tumour. Both dangers advance, in most cases, with rapidity. And if we wish to meet them successfully, the measures of relief must be not only complete but early ; in other words, time, all valuable, must not be wasted in ineffectual attempts at the taxis, when the case at all partakes of the acute character. Large herniæ are more hopeful of reduction than the small ; the inguinal protrusions are more hopeful than the femoral.

It has been proposed to relieve the stricture by means of subcutaneous section. But this proceeding is obviously so beset with danger and uncertainty as to be quite inapplicable.

The seat of stricture is exposed by cautious and regular dissection ; the incisions necessarily varying in their plan, according to the kind of tumour. Having cautiously divided the integuments and fascial envelopes, the sac is exposed, clear and glistening, resembling very much the peritoneal coat of the bowel ; and there may be some difficulty in ascertaining whether it is the sac or bowel. By pinching it up, so as to show bowel separate beneath ; or by observing serum, fat, or a portion of omentum between, we arrive at a sure diagnosis. But, this difficulty having been surpassed, another immediately arises. The sac having been exposed, are we to open it, examine the state of the contents, and divide the stricture from within ; or are we to attempt division of this from without, leaving the peritoneum intact, and so escaping the danger of peritonitis ? So long ago as 1720, Petit proposed this modification of the procedure—

leaving the sac unopened ; and the proposal has met with a varied reception since—inclining to distrust rather than otherwise. Lately, however, it has been revived under better auspices ; and, in suitable circumstances, it may be considered as the established and preferable practice. Were it applied indiscriminately, nothing could well be conceived more pernicious ; bowel or omentum might be reduced when they ought not ; or, one stricture having been relieved, another might be left—this second existing in the sac, perhaps below its proper neck, and continuing to embrace the hernial contents with fatal tightness after reduction. But, limit it to those recent cases of strangulation in which we are certain that the hernial contents are sound and reducible, and in which we are also certain that the only stricture is that which we propose to divide—then, doubtless, the extra-peritoneal operation is by much to be preferred. It is also suitable in cases of irreducible hernia, which have become strangulated ; and in which, from their large size, the ordinary exposure of peritoneum may reasonably be expected to prove especially hazardous.

If the case appear favourable for extra-peritoneal division, the investing textures are carefully divided at the neck of the tumour, so as to admit the point of the finger, or at least the finger's nail, within the tight orifice of the abdominal aperture ; and then on the finger's point, so introduced, a probe-pointed bistoury is passed, and by it the necessary enlargement is effected. Then the taxis is applied, the parts are reduced—with or without the unopened sac, according as it is adherent or not—the wound is brought together, and by suitable adaptation of compress and bandage, and avoidance of the ordinary exciting causes, reprotrusion is prevented. But if it be deemed expedient to proceed in the ordinary way, the sac is pinched up by forceps ; choosing a part where serum or fat interposes between it and the bowel—and that will generally be towards the fundus of small herniæ. By the knife's edge, held horizontally, the raised fold is divided. Through this aperture the point of the finger is introduced ; and, on this, as the best director, dilatation of the opening is made to such an extent as may be deemed advisable. However large the hernia, the opening of the sac need not be of

greater extent than what is merely sufficient for ascertaining the state of the contents, and permitting the finger to reach the site of stricture. The point of the fore-finger having been passed up to the abdominal aperture, the probe-pointed bistoury is slid flatly along it; and, by the point's edge, pressed upon the stricture, this is divided to the necessary extent. Then the hernial contents, if sound and reducible, are replaced gently, portion by portion—the last protruded, first. Recent and tender adhesions may be gently broken up with the finger, or touched with the edge of the knife; but consolidated adhesions, if at all extensive, render the parts irreducible—they should not be interfered with. If the sac be not adherent, it is replaced as well as its contents, but not along with them; for, reduction is found to be facilitated by an assistant's finger steadying and stretching the sac, while the contents are pushed upwards on its smooth and slippery surface. Reduction having been accomplished, the wound is brought together, and suitable pressure applied.

When hernia is irreducible, we content ourselves with division of the stricture. If the contents are sound, the external wound is approximated with a view to adhesion. If the contents are found gangrenous, or verging thereto, the wound is left open, to permit free discharge of the fæculent contents.

If on exposing the contents of a reducible hernia, the bowel be found merely congested; ruby-coloured, it may be; perhaps spotted by points of ecchymosis, or showing one or more vesicles of the peritoneal coat—it is reduced unhesitatingly. If showing signs of plastic exudation on its surface, it may still be reduced; no structural change has taken place but what may be recovered from. But if the point be dark-purple at some parts, greenish at another, and perhaps ash-coloured at a third, friable, and evidently fast passing into gangrene—under no circumstances is it to be reduced; else fatal fæculent extravasation must ensue. And if omentum be found dark red, emphysematous, and with its venous blood coagulated, it too must be left to slough in its outward site; in either case, however, as much care being taken to free the neck of the tumour by division of the stricture, as if the whole were fit for reduction. In the case of gangrenous bowel, it is also well to incise the sloughing part, so as to re-

lieve by copious *fæculent* evacuation. Afterwards, the treatment is as already described for artificial anus. In the case of gangrenous omentum, two modes of procedure are in our option. We may cut off the gangrened part, secure the vessels by fine ligatures, and return all within the abdomen. Or, having cut off the gangrened part, and secured the bleeding points, we may leave the rest still impacted in the abdominal outlet, with a view to its becoming permanently fixed there, and so preventing all future tendency to protrusion. The former method is usually preferred; the latter being often followed by uneasy sensations in the part, and proneness to abdominal disorder.

In all cases of doubt as to the viability of the strangulated parts, reduction should at least be delayed. It is never to be forgotten, that notwithstanding relief and replacement, the inflammatory action may still advance in the bowel, so as to cause loss of continuity by ulceration. And if this take place within the abdomen, and be followed by *fæculent* extravasation, the patient's doom is sealed.

Sometimes, after opening the sac, stricture at the ordinary sites is sought for in vain. In such cases it is likely to be found in the hernial contents themselves; a portion of omentum, for example, may encircle a portion of bowel. This is detected by careful manipulation; and is to be gently undone by the fingers—perhaps aided by a touch of the knife.

After successful reduction, by operation, the same treatment is required, as in the case of the simple taxis; rest; recumbency; antiphlogistic regimen; leeching, and calomel and opium, if inflammatory symptoms supervene; hydrocyanic acid or creasote, if the stomach continue irritable; bland enemata; but no purge by the mouth, however simple, until a good many hours have elapsed—otherwise, as already stated, dilatation with obstruction will take place above the palsied portion of intestine, and the patient will probably sink under symptoms of ileus. If intestine previous to reduction have shown an advanced stage of the inflammatory process, antiphlogistics are especially necessary, both local and general, in order to avert if possible ulceration or other dangerous structural change.

When the case is of the obscure nature, already described

—and it is difficult to say whether the hernia is to blame or not for occurrence and persistence of the untoward symptoms—let the operation for relief of stricture be performed. When the tumour itself is of an ambiguous character, when we are not certain whether it is a hernia or not, and yet the ordinary symptoms of strangulated hernia are present—again, let the surgeon operate. It is well that he should approach error on the safer side.

After the operation, the greatest attention must be paid, for some days, to prevent reproduction of descent, by keeping the compress accurately applied, and avoiding the ordinary exciting causes. Should reprotrusion take place, by the coughing, restlessness, or imprudence of the patient, the dressing must instantly be undone, and replacement effected. When the sac remains unreduced, simulation of re-descent is apt to take place, by serous accumulation within the sac; but this state is at once detected and remedied, on opening up the wound. After cicatrization, a well made truss must be worn, as in ordinary cases; it is seldom that the operation for relief of stricture effects a radical cure of the hernia.

Oblique Inguinal Hernia.

This is by much the most common form of hernia, in the male. Descent takes place along the spermatic cord, through the inguinal canal; the tumour shows itself external to the parietes, at the lower aperture; and thence descends into the scrotum in the male—constituting an oscheocele, or scrotal hernia; into the labium of the female, constituting labial hernia. The investments of the tumour are as follows: externally, the integument; then the superficial fascia of the abdomen; then the proper fascia, or fascia propria of Camper, consisting of tendinous fibres from the tendon of the external oblique; then the fascia cremasterica, consisting of fibres from the cremaster muscle; then the infundibuliform, or transversalis fascia, consisting of a prolongation of the fascia transversalis abdominis; lastly the sac.

As the tumour is about to descend, a painful fulness is found opposite the upper abdominal aperture, increased by abdominal exertion, and sustaining an impulse upon cough-

ing. Then is the time for applying a truss carefully, and opposing exciting causes, with a view to prevention of the hernia. The pad of the truss should compress the superior abdominal aperture, not the lower; for there is room enough for hernia, and strangulated hernia too, within the abdominal parietes.

To reduce this form of tumour, the pressure of the taxis is applied obliquely upwards and outwards, in the direction of the inguinal canal. In the case of large tumours of old standing, however, it must be remembered, that the canal becomes shortened as well as more direct, the two apertures coming to be almost opposite to each other; and this is attended to in the taxis. The patient is laid recumbent, with the trunk raised, and the thighs flexed and approximated.

In the operation for strangulation, a simple straight incision is made along the neck of the tumour; beginning a little above, and extending downwards on the tumour, as far as may be deemed necessary. The deep cut, for relief of stricture, is made directly upwards; in order to avoid the epigastric artery, which courses behind and to the inside of the hernia's neck. The spermatic cord is usually behind, and out of harm's way; but sometimes it is split up and scattered over the neck of the hernia—and then caution is required, to avoid the spermatic artery and duct. The stricture may exist at one of three points: in the neck of the sac itself; in the margins of the lower abdominal aperture; in the superior abdominal aperture. Sometimes a double stricture exists; each abdominal aperture being at fault. The ordinary site is at the lower outlet; but if, after free division of this, reduction is still opposed, the superior site is at once to be suspected, and explored accordingly.

At this site, it is to be remembered, a small strangulated hernia may exist, with scarcely any perceptible swelling; a minute portion of bowel being tightly embraced by the margins of the superior abdominal aperture. The symptoms are likely to be mainly those of enteritis, and attention may not be directed to the groin. In such circumstances the patient has great risk of perishing; unless, by sloughing and abscess, outward discharge occur, with establishment of artificial anus.

There are subvarieties of inguinal hernia. 1. *The Congenital Hernia*.—This is a very simple deviation from the normal state of parts ; dependent on imperfect development. It is not likely to take place till after birth ; for not until after inflation of the lungs are the exciting causes applied. But, so soon as the child is born, the exertion of crying brings down a portion of bowel or omentum along the open process of peritoneum, which exists in consequence of that which constitutes the tunica vaginalis testis having not been occluded. There is no sac, unless the tunica vaginalis be considered as such ; the bowel or omentum lies within the cavity of that tunic, in contact with the testicle—sometimes adherent to it, in which case the tumour is irreducible. Occasionally a portion of bowel contracts adhesions to the testicle while within the abdomen, and, descending with it at the usual time, constitutes this form of hernia before birth. In the reducible cases, a carefully adjusted truss is worn constantly ; preventing protrusion ; tending to obliterate the peritoneal opening ; and so, speedily and surely, effecting a radical cure.

2. *Hernia Infantilis*.—This term is applied to a more complicated state of parts, originating also in early life. The communication between the cavity of the tunica vaginalis and that of the abdomen is shut at its upper part ; but the former cavity is unusually spacious, and ascends high in the cord, containing more or less serous fluid. Behind this a hernia descends, invested by the ordinary peritoneal sac. In cutting down on such a tumour, we divide first the anterior portion of the tunica vaginalis, then the posterior ; and, after this, appear the sac and its contents—unless the former, as is not unlikely, be incorporated with the posterior layer of the tunica vaginalis. This form is of very rare occurrence.

Ventro-inguinal Hernia.

This is also called the *Direct* inguinal hernia. The descent is unconnected with the superior abdominal aperture ; and takes place through the abdominal parietes, immediately opposite the lower aperture—the common tendon of the internal oblique and transversalis muscles giving way at that

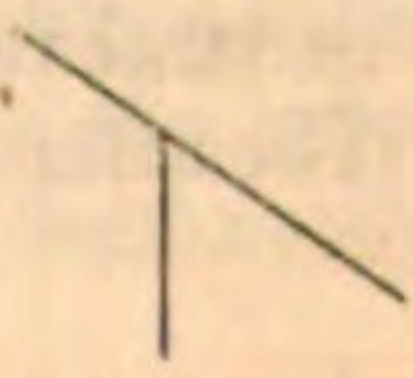
point. Sometimes, however, that tendon is pushed before the tumour, and forms one of its investing fasciæ—protrusion in that case not being through the lower abdominal aperture, but near it. The ordinary coverings are the same as those of the oblique variety ; only, this descent being not directly connected with the cord—which is on its outer aspect—there is no cremasteric expansion. The course of the epigastric artery is external to the neck of the tumour. And hence the general rule, in all cases of inguinal hernia, when strangulated, is to make the deep relieving incision directly upwards, parallel to the linea alba ; whether the descent be direct or oblique, the artery is safe. In the direct form, the pressure of the taxis is made directly upwards.

Femoral Hernia.

This is most frequent in females ; the greater space, in the normal state of the parts, obviously favouring protrusion. Descent takes place through the crural aperture, on the inside of the femoral vessels, and through the saphenic opening of the fascia lata. In the crural aperture the neck of the tumour is contained ; the fundus, resisted in its descent on the thigh, makes a sharp turn upwards, and lies on the lower part of the abdominal parietes ; the neck is beneath Poupart's ligament, the fundus may be above it. And this must be attended to in applying the taxis ; the tumour being invariably unbent, as it were, and made straight, ere the reductive pressure is applied. The tumour is usually of small size ; often not bigger than a pigeon's egg ; sometimes it is of even huge dimensions ; but its average bulk is much below that of the inguinal varieties. The coverings are, integument ; the superficial fascia of the thigh ; the infundibuliform, or proper fascia, obtained from the femoral sheath, and continuous with the fascia transversalis and fascia iliaca ; lastly, a covering obtained from the textures which normally occupied and occluded the crural aperture. Very often the two last named coverings are matted together, into one dense fascia ; and thus we may expect occasionally to meet with but two investing layers ; one the superficial fascia ; another beneath it, deep, dense, and strong. Not un-

frequently the deep layer splits at its lower part; and the fundus of the tumour, emerging through the aperture, may be found covered only by the superficial fascia and integument.

There are two peculiarities in applying the taxis to this tumour. The position of the patient is as for the inguinal; but with the limb on the affected side bent much upwards, and at the same time carried across its fellow, so as to relax the crural arch, on which, and not on Poupart's ligament, constriction depends. Also, as already stated, the neck of the tumour must be unbent and made straight, before reductive pressure is made on the fundus; in other words, the tumour is first pushed down on the thigh, and then upwards into the abdomen. After reduction, a well made truss is applied; the pad resting on the outside of and beneath the spine of the os pubis.

Strangulation is both more common and more severe than in the inguinal forms of hernia. The operation for its relief is performed thus:—The skin, having been pinched up, is divided by transfixion; in order that there may be no risk of injury to the important parts beneath. The form of this integumental wound may be greatly varied; an inverted T; an inverted Y; a V; a simple oblique cut; or  The investing textures are cautiously divided, by the forceps and knife—the latter held horizontally; and the sac is exposed. Usually, the opening of it cannot be avoided. And, this having been done, the forefinger of the left hand is passed up to the neck of the tumour. Here, as in the oblique inguinal hernia, there may be two strictures, a superficial and a deep. The former considerably anterior to the ligament of Gimbernath, and independent of it; formed by the inner and anterior part of the crescentic portion of the crural arch; felt tight, on the inside of the tumour's neck, while the finger's point is yet at some distance from the actual brim of the pelvis. This resistance is divided, in the first instance, by a probe-pointed bistoury—slid flatly along the finger, and afterwards having its point's edge directed upwards and inwards. Dilatation is then made by the finger; and, on withdrawing this, reduction may be effected, readily. If not, then the finger is re-intro-

duced; and, pushing it upwards, Gimbernat's ligament is felt tight and resisting, on a higher level than the former site of constriction. It is divided in a similar way, the bistoury's point being barely insinuated within the pelvis; the least movement of its blade suffices; a notch in the edge of the ligament is enough; the finger, following, dilates. Were the deep incision to be made directly upwards, Poupert's ligament would be divided—an unnecessary act, that texture being unconnected with the constriction; and, besides, the spermatic cord in the male, and the round ligament in the female, would be endangered. If the obturator artery arise by a common trunk with the epigastric, it is likely to encircle the neck of the sac within the pelvis. And were the bistoury, which divides the higher stricture, to be used rashly—without the guard of the finger, and with any part of its blade thrust over the brim of the pelvis—this vessel would doubtless run no slight risk of being wounded. But, with ordinary precaution—the fore-finger preceding the knife, and merely the bulbous point transgressing the pelvic brim—the vessel is safe, whatever be its distribution.

It is in this form of hernia that we are most liable to be puzzled, as to the exact nature of the tumour. But the safe general rule, as formerly stated, is—when in doubt, operate. The after treatment, is as for the inguinal operation.

Umbilical Hernia.

This is common in infants; and in women who have borne many children, it is not unfrequent. In the former it very readily occurs; the exertion of crying forcing the bowel or omentum outwards, through the yet unconsolidated umbilicus; forming a soft, impulsive tumour; at first of small size, not larger than a button—commonly called “a starting of the navel.” In women, unless congenital, it is seldom a true umbilical hernia; protrusion having taken place near, not through, the navel—in consequence of a yielding of the abdominal parietes there, probably during parturition. Strangulation is comparatively unfrequent. In the adult, the tumour may attain to an enormous size.

In the child treatment is both simple and effective. The

exciting causes are averted, as much as possible ; crying, more especially. And compression is made by means of a conical pad—such as a piece of cork, covered with wadding or soft leather—which is made to occupy the space usually filled by the protrusion, and is retained in its place by strips of adhesive plaster; the integument is closed over it in a fold ; and the whole may be secured by a large circular piece of soap-plaster spread on leather. This simple contrivance is more effectual than any truss or belt, being much less likely to slip ; and it has the equally important advantage of not acting as an excitant of protrusion elsewhere. In the course of a year or two—it may be, of months only—the parts are found consolidated, and further use of the compress is unnecessary.

In the adult, the case is not so easily managed. The tumour is larger and less repressible. A corresponding compress is necessary, secured either by a belt or by the spring of a truss. Its use is merely palliative. When strangulation occurs, relief is obtained in the ordinary way. The external wound need not be of large dimensions ; most frequently, the hernial contents are found to have no coverings but the integument and the sac ; the deep incision for relief of constriction, made by the probe-pointed bistoury on the fore-finger, is placed in the mesial line, usually on the lower aspect of the swelling. The taxis is made directly backwards.

The other varieties of Hernia.

Ventral hernia is a protrusion at any part of the front and sides of the abdominal parietes, except the navel and groins ; the result of a giving way at some unusual point, in consequence of bruise, wound, abscess, or muscular rupture. There are no peculiarities in the tumour or its treatment ; excepting, that, as in most cases of the last mentioned variety of hernia, but few fasciæ need be expected to invest the sac. A *Perineal hernia* is said to exist, when bowel or omentum, with its sac, descends between the bladder and rectum, and presents itself as a swelling in the perineum. The term *Vaginal* is applied, when, in the female, the tumour does not reach the perineum, but bulges into the vagina. The *Dia-*

phragmatic or *Phrenic*, the *Obturatorial*, and the *Ischiatic* forms of hernia—protrusions through the diaphragm, the obturator foramen, and the ischiatic notch—are fortunately rare. They do not admit of accurate diagnosis in life; and are not amenable to surgical treatment, if strangulated.

The *Hernia Litrica*, as noticed by M. Litre, is said to exist when the protruded viscus is a diverticulum of bowel, not a portion of the normal calibre of the intestine. The diverticulum may be congenital; a mere prolongation of bowel, consisting of all the normal coats. Or it may be of recent occurrence, formed by a protrusion of the mucous membrane of the intestine through its muscular coat, and consisting of the mucous and peritoneal coats alone. Both forms, the *diverticulum acquisitum* as well as the *diverticulum congenitum*, are liable to hernial protrusion; the former found only at the crural aperture, and always of slow formation. This form of diverticulum being made at the expense of the main bowel, the calibre of the latter is narrowed thereby; and the traction caused by hernial descent also changes the line of direction in the bowel, forming a sharp angle at the origin of the diverticulum. Above the narrowed and somewhat obstructed part, dilatation takes place; and a train of unpleasant symptoms result—costiveness, colicky pains, dyspepsia, flatulency, &c. The congenital form of diverticulum, on the other hand, may protrude without causing any such inconvenience. Strangulation occurring in either case, is marked by the ordinary symptoms, follows the ordinary course, and requires the ordinary treatment. But, probably the symptoms will partake more sparingly of the signs of obstruction, than in ordinary cases, at least in the first instance.

CHAPTER XXIX.

AFFECTIONS OF THE RECTUM.

Abscess Exterior to the Rectum.

ABSCESS in the cellular tissue exterior to the rectum is almost always of an acute character, and generally affects ado-

lescents or young adults of a weakly system. There are two distinct varieties, according to the site. One is quite external in the nates ; early pointing outwards ; attended with no great constitutional disturbance ; not tending to burrow backwards on the bowel ; and generally getting well under the simplest treatment. The other originates in a comparatively deep locality, by the side of the bowel, perhaps nearly two inches from the orifice. Pain is great, and the constitutional disturbance severe ; evacuation of the bowels is seriously impeded, and when attempted the suffering is greatly increased ; at first no fluctuation is to be perceived, but hardness is felt on firm pressure with the finger, by the side of the anus, and also when the finger is passed within the bowel ; throbbing pain continues, the hardness enlarges, and ultimately a softening may be detected in its centre ; matter forms rapidly and in quantity ; it may slowly and painfully reach the surface ; or, slow in its outward direction, the gut may give way by ulceration, and by this aperture the pus may be imperfectly discharged.

In treatment, our main object is to procure early and outward escape ; attempts at prevention of suppuration having previously failed. In the deep variety, the plunge of a bistoury, by the side of the bowel, so soon as softening has begun, is essential to prevent great constitutional disturbance and risk of the establishment of anal fistula. After evacuation, great attention to the general health will be required ; inasmuch as, without considerable improvement in the tone of system, it will be found difficult to heal the wound, and equally difficult to prevent recurrence of the abscess. Not unfrequently a cachexy is met with, which baffles all remedial efforts—phthisis of the lungs. In short, abscess exterior to the rectum is to be looked upon with suspicion, as regards both part and system—and treated accordingly.

Rectitis.

The inflammatory process affects the rectum not unfrequently ; of idiopathic origin ; or caused by external injury, lodgement of foreign matter, or exposure to cold ; or connected with an excited state of hæmorrhoids ; or an extension of

inflammatory action from a contiguous part. In acute cases, the symptoms are very severe. The part is somewhat swollen, and is most exquisitely painful ; the sphincter acts spasmodically, and each movement of it aggravates pain to torture ; intense burning heat is complained of ; a scalding discharge passes away ; or, in intense cases, the heat is at first dry as well as burning ; the constitution suffers severely, by fever. The urinary organs sympathize ; there is painful micturition, and not unfrequently strangury or even actual retention occurs. The progress and results vary. Resolution may take place, with copious mucous discharge—perhaps with hæmorrhage. Or, the discharge is purulent, coming from the mucous coat ; and the resolution is both slow and incomplete. Or, ulceration may take place ; superficial and broad, limited to the mucous lining ; or circumscribed and perforating, causing an aperture into the cellular tissue without, where fresh abscess forms, and fistula results. Or, the action proving of a minor but persistent nature, plastic exudation takes place in all the coats, but more especially beneath the mucous ; and simple organic stricture is established.

Such being the risks of an advanced or obstinate inflammatory process in the rectum, treatment comes to be regarded as important ; early and effectual, to anticipate evil. In the first instance, the cause is to be ascertained—and, if possible removed ; foreign bodies, for example, will be taken away, and ascarides expelled. The recumbent posture is enjoined, and blood taken away by leeching. No purgatives are given—but gentle enemata, if necessary. To allay spasm, and to soothe the sympathetic irritation under which the urinary organs generally suffer, opium is useful ; in ordinary doses by the mouth ; and largely applied to the part, in the form of inunction, enema, or suppository. Fomentation can scarcely be applied too hot or too sedulously.

Fistula in Ano.

By this is understood a fistula, or sinus, by the side of the rectum ; sometimes opening externally in the nates, but not communicating with the bowel, and then termed Blind External fistula ; more frequently communicating with the bowel,

but not yet opening externally, then termed Blind Internal fistula ; usually having an aperture of discharge both externally and into the bowel, and then said to be Complete fistula. In the complete form—by far the most frequent—there is discharge of purulent matter by the fistulous track ; flatus also escapes, and fæculent matter. There is heat and much discomfort, often pain, increased by spasms of the sphincter ; not unfrequently aggravations take place by recurrence of inflammatory action ; and usually the general health is more or less undermined. Healing is prevented by at least three circumstances ; the fistulous condition of the cavity and aperture—obviously unfavourable to contraction and consolidation ; the frequent, almost constant, passage of foreign matters along the track ; and the frequent motion caused by the action of the levator and sphincter ani. The sinus may be monocular or multilocular ; that is, consisting of one simple track, or having more than one collateral sinus connected with the main and original one—the minor probably the result of intercurrent inflammatory attacks. The cavity may be wide within ; more frequently it is narrow—of the nature of true fistula ; it may extend high above the sphincter, more frequently its end is within two inches of it. The internal opening—to be found in the great majority of cases—is invariably within easy reach of the finger ; usually about an inch and a half from the orifice ; of various dimensions, sometimes so small as not to admit the end of a common probe, but seldom if ever so large as to allow of the passing of a finger's point ; its size, circular form, and general character, denoting its origin to have been by perforating ulceration of the bowel.

Such perforating ulceration is the proximate cause of complete fistula ; and it may come from without or from within. According to Sir B. Brodie, the origin is always from within ; rectitis produces perforation ; through the aperture, fæculent matter escapes into the cellular tissue without ; abscess forms there, which, only partially discharged by the internal and original opening, ultimately gains the surface, on the nates, and is thence mainly evacuated. That such is the state of matters in the majority of cases, there seems no reason to doubt. But it cannot well be denied that not a few cases may and do follow a different course. Abscess begins in the ex-

ternal cellular tissue, idiopathic, or caused by injury, or following exposure to cold; it slowly advances outwards, at the same time burrowing by the side of the bowel. The matter may escape externally, while the bowel's coats are yet intact; constituting Blind External fistula. Much more frequently, there is the internal opening too; of secondary formation, however, not primary—caused by pressure from without, and beginning in the peritoneal coat. And that this tunic is capable of taking the initiative in perforating ulcer, although less easily and more rarely than the mucous—even without so powerful an exciting cause as the pressure of an abscess—cases are not wanting to prove.*

Very frequently, fistula in ano is co-existent with pulmonary phthisis; probably caused by it, and constituting but one of the symptoms and signs of that intractable malady. The frequent cough of the invalid, causing straining on the bowel—and the tendency to mucous ulceration in the great gut, so favourable to the production of the initiatory perforation—readily explain how the anal and pulmonary affections should not unfrequently be in close connexion.

The history of fistula is not complete till careful examination has been made, by means of the probe and finger. The latter having been introduced into the bowel, the probe—with a broad and bulky termination to its handle, so as to render it more obedient to the hand, and enable it to indicate with certainty the direction of the point when curved—is passed gently into the track, or tracks, so as to ascertain their number, position, and extent; but most especially to ascertain the exact position of the internal aperture—that is, on what aspect of the bowel it has formed, for, as already stated, it is as to height almost always just within the sphincter. In order to facilitate the entrance and movements of the probe, it is sometimes necessary to dilate the external opening in the first instance. When there is no outward opening, the case being an example of the Blind Internal variety, there are usually plain enough indications of the site of the abscess—hardness, discolouration, pointing, &c.; and a plunge of a lancet or bistoury will at once change the case into the complete form.

* *London and Edinburgh Monthly Journal*, January 1844, p. 40.

Or, a probe, bent very much, may be introduced by the rectum into the internal opening ; and by pushing the handle on the opposite nates, its point may be made to project on the affected side, and being felt there may be cut upon.

The treatment of fistula is simple—and, if the disease be merely local, usually quite effectual. The main obstacles to healing are, the fistulous condition of the track, and the frequent motion by muscular action. By laying open the track, and at the same time dividing the sphincter, both are overcome. The patient is made to stoop over a bed or table, with the limbs unbent and somewhat apart. An assistant separates the nates to the full. The surgeon, seated, inserts the probe, taking especial care to lodge its extremity in the bowel through the ulcerated internal opening. The probe may be grooved, so as to admit of a curved, strong, probe-pointed bistoury being passed along it; or, the probe having been withdrawn, its place is occupied by the bistoury—used at first merely as a probe. The point is then met in the bowel by the fore-finger of the other hand—right or left, according to circumstances, for here ambidexterity is essential—and with the point pressing firmly on the finger, and with the edge moved in a gently sawing motion, both hands are brought down towards the operator, causing division of all that is within the concavity of the instrument. When this is of considerable thickness, or of almost cartilaginous density—as not unfrequently is the case—a particularly stout and well-tempered blade must be selected for the service, lest it give way. It is unnecessary, however, to divide any great extent of parts, for the following reasons : There is almost always an internal opening ; this is invariably situate just within the sphincter ; it is essential to make the line of division pass through this aperture ; but, that having been done, there is in no case any necessity for passing the knife higher, however extensive the fistula may be. It is by no means uncommon to find the track passing higher than the internal opening ; yet in these cases the ordinary operation is all that is necessary ; the knife entering at the ulcerated opening, and no higher. One obvious advantage of this is, the avoidance of danger from loss of blood. A high division might implicate arterial branches of considerable importance. In the approved operation, only

small branches will spring ; they are seen at the time of division, and can readily be secured by ligature, if need be—as is very seldom the case. Should any superficial sinus exist—burrowing beneath the integuments—it must be freely laid open.

In the external form, in progress of formation by abscess originating in the cellular tissue, it has been proposed to evacuate the abscess, and then at once to complete the operation for fistula; hoping thus to save time and pain. It is better to evacuate, and delay; permitting the abscess to contract, and to degenerate into the condition of fistula; then operating for the cure of fistula. The wound is less painful and less extensive; and the result is at least equally satisfactory. In the blind external form—that is, when we have searched carefully for the internal opening, and found none—which will seldom be the case—the bistoury, having been passed to the usual site of opening, has the edge of its point inclined towards the finger introduced within the bowel; by a gentle sawing motion perforation is effected; and then the operation is completed in the usual way.

The use of the anal speculum may assist in detecting the internal opening. And when this is found, the speculum may be retained as an auxiliary in the operation; the parts yielding much more readily to the knife when put upon the stretch, as they are by the lodgement of the open instrument.

Immediately after withdrawing the knife, bleeding is attended to. If an artery spring, it is tied; if there is oozing, at all formidable, pressure is applied by stuffing the wound moderately with lint. Usually, there is no necessity for any hæmostatic; and it is enough to interpose a small portion of lint, or other dressing, between the lips of the wound, so as to prevent premature closure of the superficial part; our object plainly being, that the whole track shall inflame, granulate, and heal from the bottom. No cramming is necessary; slight dressing is sufficient.

Before the operation, the bowels have been well cleared out by a purgative, aided by an enema, if necessary. After the operation, a full dose of morphia is given; to lull the pain, and at the same time to prevent movement of the bowels—this not being contemplated for a day or two. At

the end of the third or fourth day, a dose of castor oil is given ; and this, operating, brings away the contents of the rectum, including the dressing of the wound. Afterwards, it is enough to regulate the bowels ; to make sure, by examination from time to time, that the wound is not closing prematurely, and that superficial sinuses are not forming ; to attend to cleanliness ; to apply water-dressing, by means of lint and oiled silk, in the first instance—retaining the dressing by a T bandage ; afterwards medicating this dressing by the ordinary stimulants, as the state of the granulating surface may require. For obvious reasons, a close regard is paid to the system, throughout.

If fistula in ano co-exist with evident and advanced pulmonary phthisis, a question arises as to the propriety of operation. It may safely be answered in the negative. For, first, the operation will fail in its local effect ; the wound, in all probability, will not heal. And, secondly, supposing that it did heal, the result would probably be most injurious on the system ; the pulmonary disease advancing with fresh virulence, on the closing up of an outlet whence purulent and tubercular matter had long been habitually discharged. In like manner as the temporarily and locally successful amputation of a strumous joint, may have the effect of greatly shortening the phthisical patient's term of existence.

Fissure and Ulcer of the Anus.

Fissures of the anus are extremely troublesome. A chap or crack, analogous to what is observed on the prolabium, forms on the verge of the anus, in the mucous coat of the bowel ; and is the seat of much pain, often of intense agony, more especially when the bowels are moved ; then, too, spasm of the sphincter adds greatly to the discomfort. Sometimes, indeed, the muscle is found to be in a state of almost perpetual spasm ; simulating most of the signs of stricture of the bowel. And the existence of the fissure may be obscured, in consequence of the obstacle which such spasm affords to ocular examination. Almost invariably, this affection is found connected with previous disorder of the primæ viæ—

perhaps a long continued dyspepsia. And, in treatment, this circumstance has an important bearing. For, no local management can be expected to prove fully successful, unless the cause be taken away; that is, in most cases, the noxious matter lodging in the bowels must be removed, and the functions of the mucous lining must also be amended. In such cases, a cautious dose of calomel will be found the most suitable prescription at first; followed up, according to circumstances, by gentle laxatives and alteratives. The part may be touched freely with nitrate of silver, or with the fluid nitrate of mercury; and relief of pain will be obtained by belladonna-ointment, or hot poultices medicated strongly with opium in solution. Very frequently, however, such local treatment is resisted; and then a simple and slight operation is required. By means of the forefinger and a probe-pointed bistoury, an incision is made through the mucous coat, including the fissure. And thus the irritable sore is at once converted into a simple wound, which first inflames, and then heals in the usual manner. But should this fail—as will seldom be the case—the knife has again to be used; pressing it more deeply, the sphincter ani is divided; and the part, thus set at rest, quickly heals. To recapitulate; in all cases, great and primary care of the stomach and bowels is necessary; with this, some fissures heal under the ordinary local treatment suitable to irritable sores; others require simple incision; and others, more obstinate, demand, in addition, division of the sphincter.

Ulcers of the mucous membrane of the anus are liable to assume the irritable character, and are productive of the same distressful symptoms as the fissures. They require, and are subject to, precisely similar treatment. Situated more internally, they are but seldom visible, even on the most careful examination. The finger, cautiously introduced, detects them, by the peculiar feel which the ulcerated part conveys to the examiner, and by the great increase to the patient's suffering which is invariably produced by the finger's resting upon that part of the bowel.

Immediately in front of the coccyx—that is, at the back part of the anus—a broad and deep ulcer, capable of receiv-

ing the finger's point, has been not unfrequently observed. It is peculiar as to its site and extent, but not as to character and treatment.

Hæmorrhoids.

Hæmorrhoids, or *Piles*, are divided into two great classes; external and internal. They seldom occur before puberty, and are more common in females than in males. The predisposing causes are, whatever tends to determine blood to the rectum, and to retard the return of blood from it; habitual constipation, pregnancy, abdominal tumours of any kind, torpor of the liver, sedentary avocations with luxurious living. And the exciting causes are, whatever acts on the bowel itself excitingly, as purging, bilious diarrhœa, exposure to cold and wet.

External piles are of but one structure; a congeries of varicose veins, surrounded by hypertrophied cellular tissue, and covered partly by mucous membrane, partly by loose rugous integument. They may be undergoing the inflammatory process, or they may be indolent and quiet. At one or more points, ulceration may have exposed their interior, and they bleed; or they may be *blind*, as the phrase is—emitting no blood. The varicose veins may have their normal fluid contents; or these, coagulated, may have caused condensation of the tumour, more or less complete. The tumour may be single; usually more than one exists.

Treatment is palliative and radical. The latter consists in removing the morbid formation, by scissors or bistoury; leaving the sore, which remains, to heal in the ordinary way. Palliation varies according to circumstances. If the part be inflaming, rest and the ordinary antiphlogistics are necessary. If it be in the indolent state, stimulants and astringents—iodine, galls, hellebore—are applied, with the view of puckering up the loose integument, obtaining discussion of the solid abnormal textures, and restoring the normal condition of the veins. The bowels are carefully regulated; and, for this purpose, sulphur is the favourite medicine; dosed so as to avoid over-action, while it ensures a daily and sufficient passage of a semifluid stool. And if any dyspeptic, or other disorder of

the primæ viæ exist, that must be removed as speedily as possible. Very often the liver is to blame.

Not unfrequently, a small, recent, tense pile presents itself, acutely inflamed, and exquisitely painful. A simple proceeding not only affords present relief, but also may effect a radical cure. With a lancet or bistoury it is to be laid freely open, throughout its entire extent; the coagulated blood rolls out, a salutary loss of fluid blood takes place, and in the subsequent healing of the wound consolidation is effected.

Internal piles are of different kinds. 1. They may be of the same structure as the external; varicose veins, surrounded by hypertrophied cellular tissue, and covered by mucous membrane more or less altered; open, or blind; inflaming, or indolent. 2. They may be genuine tumours, of the nature of simple sarcoma; more or less pendulous in their form. 3. They more frequently are of the nature of erectile tissue; this anormal development having taken place in the submucous cellular tissue, as well as in the membrane itself. The tumour usually presents a broad base of attachment; and sometimes the surface resembles that of the strawberry.

Internal piles are most commonly of the last variety. If large and numerous, they may constantly protrude more or less from the anus; a general relaxation of the mucous membrane of the rectum admitting of this. More frequently, they do not show themselves externally, except when the bowels are moved; and then the straining causes them to descend. If not replaced, they may become constricted by the sphincter, and inflame. At each stool, it is common for blood to be lost; small arterial jets taking place from one or more points of the tumour—more especially if constricted. Usually, the patient gets into the habit of replacing the prolapsed tumours, after each evacuation; and, during the intervals, he may sustain no great inconvenience in the part. If the loss of blood, however, be habitual—even though but a small quantity escape at each time—the system is certain to give way under it; the patient becoming thin, weak, pale or sallow, dyspeptic, annoyed with tinnitus aurium, giddiness, and palpitations. If the tumours are bulky, and often protruded, they are always in a more or less excited state; there are

pain, swelling, heat, and discomfort, discharge of mucous and puriform fluid ; and these, superadded to the effects of loss of blood, speedily undermine the frame. In extreme cases, the whole bowel is relaxed ; and prolapsus ani accompanies and untowardly complicates the hæmorrhoidal state. At any time, the inflammatory process may extend from the anormal structure, and seize the bowel—producing rectitis, probably of an aggravated form. Thence abscess and fistula may result ; or, under a minor degree of action, simple organic stricture may form. The urinary organs sympathize greatly, during rectal excitement connected with piles—whether these be external or internal.

To allow such an affection to follow its own course, is thus seen to be dangerous to both part and system. The treatment is general and local, palliative and radical. The general treatment is to be pursued in all cases ; regulating the bowels, looking to the liver, attending to regimen. Hæmorrhage may be restrained by the internal exhibition of gallic acid, oil of turpentine, or other suitable astringent. If palliation only be intended, the local treatment will consist of careful reduction, after each evacuation of the bowel, and the occasional injection of some astringent fluid ; such as solutions of rhatany, zinc, or oak-bark. If excitement occur, then come antiphlogistics, anodynes, and attention to the bladder. The radical treatment consists of removal by ligature. In the case of the solid genuine tumour, the knife might be used perhaps with impunity. But such formations constitute a small minority of internal piles. The overwhelming majority are vascular ; and the greater number of these consist of erectile tissue. To cut out these, were on each occasion to endanger life by hæmorrhage ; not only because the parts are so vascular in themselves ; but also because the interior of the rectum is so favourable for the continued oozing of blood, and so ill adapted for the application of pressure or other direct hæmostatics.

The operation by ligature is thus accomplished. The patient having had the bowels freely opened, is placed as for the treatment of fistula. By previous straining at stool—increased at the time, if necessary—the tumours are made to protrude to the full ; an assistant separating the nates. If the

form be at all pendulous, it is well to seize the fundus by means of a large volsella, and over this to apply a strong ligature, drawn very tightly around the neck of attachment. But if the base be broad, and the form of the swelling irregular, it is necessary to transfix the base by means of a stout needle ; and, by tying separately the halves of the ligature, so to effect strangulation. Before tightening the second half of the knot, it is well to incise the livid fundus, permitting the fluid contents to escape ; for then the noose can be tightened more thoroughly. And the tighter the constriction, the more rapid and less painful is the cure. Deligation having been completed, the ends of the ligature are cut off close to each noose ; and, by gentle manipulation, the strangled parts are replaced within the sphincter. If an external hæmorrhoid, or loose fold of skin be found, it is removed by the sweep of a knife or scissors. A full dose of morphia is given, to lull pain and prevent motion of the bowels. The bladder is watched ; and if strangury or threatened retention occur, warm fomentation is to be sedulously applied to the hypogastrium, along with the internal administration of henbane and sweet spirits of nitre, in small and repeated doses. By medicated poulticing, the pain in the anus may be somewhat assuaged. In a day or two, the sphacelated parts separate ; and the remaining sore is treated as its circumstances may demand. Fœtor is subdued by the chlorides.

In the slighter cases, nitric acid has of late been used with advantage ; when the tumours are small, recent, and consist of altered mucous membrane—investing slightly varicose veins, or perhaps only hypertrophied cellular tissue—the disease being mainly resident in the membrane itself. The parts, having been made to protrude, are rubbed over with strong nitric acid, so as to produce an eschar ; and are then replaced within the sphincter, as in the case of deligation. The eschar separates, removing the altered membrane ; the sthenic suppurative action, which attends on cicatrization, would seem to act restoratively on the textures around ; and the tightness of the cicatrix, when completed, may by its support prevent recurrence of varix beneath.

Patients of greatly deranged livers are subject to general fulness in the lining membrane of the rectum, perhaps with

one or more internal hæmorrhoids, accompanied by a febrile state of system. In such cases, we are not to operate in any way, until the liver has been restored to a healthy, or at least quiet state, and the general excitement has been calmed—otherwise the result might be serious, by aggravation of the internal and constitutional disorder.

In elderly, full-living patients, also, affected with disease of the heart, or showing a tendency to affection of the head, bleeding piles are not to be rashly interfered with; else the sudden cessation of discharge, and subsequent plethora, may entail the most calamitous results. The operation, if had recourse to at all, is not performed till after due preparation of the system. And the after treatment is conducted with much care and caution.

Similar precaution is requisite in the case of females, from whom blood escapes in large quantity and periodically, because vicarious. Such bleeding, however, is not always connected with piles. It may proceed from the lining membrane, little if at all changed.

Polypus of the Rectum.

Simple polypi are occasionally, yet seldom, found in the rectum; most commonly in children; and then may be mistaken for prolapsus. There is frequent desire to go to stool, with discharge, uneasiness, and occasionally pain and swelling. At each evacuation, the growth is protruded, and usually requires replacement. The treatment is ablation, by knife or ligature. Obviously, the preferable method is by deligation; but, after the ligature has been secured on the neck of attachment, the main body may be safely cut away, in order to prevent tension, and expedite the cure.

Prolapsus Ani.

In consequence of relaxation, the rectum may become everted, on straining, and protrude beyond the anus; and the protrusion may be either constant, or occasional. Also, it may be either partial or complete; that is, the protrusion may consist of the entire bowel—or, as is by some supposed,

of rather the sigmoid flexure of the colon ; or it may be merely a descent of the mucous coat alone—a frequent concomitant, as has already been observed, of internal hæmorrhoids. This partial prolapsus may occur at any age ; and is probably most common in the middle-aged ; but the complete form is an affection almost peculiar to the two extremes of life ; old age and childhood. The child is liable to irritation of the bowel, by ascarides, or by a perverted secretion from the general mucous coat ; and the habitual straining, which results, tends to the change in question. In the old man too, there is much straining ; by reason of enlarged prostate, or debility of the muscular coat of the bladder. In the child there is much crying ; in the old man much coughing. Stone and stricture may induce prolapsus at any age.

The tumour varies in size, from a mere annular border to the anus—as in the partial prolapsus—to a swelling as large as a child's head. The membrane, if habitually down and exposed, changes more and more to the cuticular character ; much discharge takes place, of a reddish jelly-looking substance ; inflammatory aggravations are very liable to occur, causing much increase of distress ; and, at any time, the existence of descent is accompanied with painful uneasiness in the part, and an oppressive general languor and debility—at least in the adult.

In the child, the affection may generally be removed by riddance of its cause. At the same time, care is taken to replace the bowel after each descent ; the bowels are duly regulated ; and evacuation should always be made in the recumbent posture ; crying should be avoided as much as possible ; astringents may be used both outwardly and within—that is, in the form of lotion, ointment, injection, or suppository ; and iron or other tonics are usually indicated, by laxity of the general system. If protrusion have been neglected, and have attained a large size, some difficulty may be experienced in effecting replacement. Pressure is applied, as in the taxis for hernia ; the parts having been previously lubricated. And it is well to make the reducing pressure chiefly during the straining or crying efforts of the patient, the verge of the anus then presenting a fixed point on which the reduction may be made. If the protruded part be found constricted,

inflaming, and swollen, it is better not at once to attempt reduction ; but, in the first instance, to reduce the bulk and inordinate action, by leeching, rest, and the ordinary anti-phlogistic means.

In the adult, there is the same necessity for removal of the cause, if possible ; but unfortunately cure seldom follows so simply. The same attention to replacement is to be enforced ; and a pad is worn, directly compressing the anus, so as to oppose reprotrusion. This pad—slightly conical in form, so as to fit into the anus—may be applied by means of the common T bandage ; or, what is better, is adapted to a spring, as in the truss for hernia. Astringents are used, the bowels are regulated ; and amendment, if not cure, is hoped for. It is well, perhaps, to procure the daily stool at night ; so that afterwards the long recumbency of bedtime may prove favourable, in obviating the tendency to protrusion which is greatest after functional excitement of the part.

In extreme cases, when it is impossible by the ordinary means to prevent constant, or almost constant protrusion, other measures are required. One or more of the redundant folds of the mucous membrane may be removed, by knife or ligature ; in the hope that the contraction of healing may sustain the replaced parts in their normal relation. Or, the loose folds of the integument of the anus may be more or less freely excised, with a similar object in view. This failing, another operation has been proposed ; an abbreviation of the sphincter. By incision, a portion of this muscle is to be removed ; and then the remainder, having been brought together, and got to adhere, is expected to constitute a more active and effectual guardian of the mucous outlet. The success of this proceeding, however, has yet to be proved. And, in any such operation, especial care must be taken lest the task be overdone ; and an unnatural tightness of the orifice result.

Stricture of the Rectum.

Contractions here, as in other mucous canals, are of three kinds ; spasmodic ; organic and simple ; malignant. The *Spasmodic* does not frequently constitute a disease of itself ;

but is rather an accompaniment of some other affection—as hæmorrhoids, fissure, or ulcer of the anus. Its main symptoms are, painful tightness of the part, with difficulty and pain in voiding the fæces. The site of constriction is at the orifice of the bowel; and the immediate cause is spasmodic action of the sphincter muscle. If it be but an attendant of another disease, removal of the latter will ordinarily suffice for cure. In the few cases of its single occurrence, the treatment consists in rectifying the primæ viæ, which will invariably be found more or less deranged; and in the occasional use of a short bougie, of metal or caoutchouc, passed just within the sphincter, and retained for but a few minutes on each occasion. An obstinate case may render division of the sphincter expedient.

The simple organic stricture is the result of a chronic Rectitis, as already stated. The constriction depends partly on condensation and thickening of the entire coats of the bowel; but mainly on deposit in the submucous cellular tissue. The ordinary site is about two inches from the orifice; and it is seldom indeed that this form of stricture is found to be beyond reach of the finger. The leading symptom is difficulty in defæcation, with slimy discharge; the fæces passing in a flattened and attenuated form, like tape, when solid, and when fluid being liable to forcible ejection as if from a syringe. Derangement of the digestive organs, with impairment of the general health, is induced; the abdomen becomes swollen, perhaps tympanitic; and the urinary organs are sympathetically involved. Above the stricture, dilatation takes place; and there ulceration is apt to occur in the mucous membrane; greatly aggravating the distressful symptoms, perhaps inducing fistula—and, in the aged, not unlikely to degenerate into an assumption of malignancy. From the obstructed state of the bowels, enteritic symptoms are not unlikely to arise; but, independently of sudden or casual aggravations, life is ultimately endangered by advancing emaciation and general disorder. Treatment consists in maintaining a gently open state of the bowels, mitigating the painful symptoms in the part and neighbourhood by suitable remedies, and gradually obtaining dilatation of the bowel at the contracted part, by a cautious use of the bougie; not failing to remember that the

cure is not by mechanical dilatation, nor by inflammation, but by gradual absorption of the submucous anormal deposit. The best form of this instrument is that made of caoutchouc, pliable, smooth, yet dense enough to resist circular compression. Having been introduced gently, it is retained so long as the feelings of the patient permit; and it is well that the lower part of the instrument should always be small, so as not to distend the sphincter and cause irritation. Or the bougie may be so formed as to lodge wholly within the bowel; an attached ligature or tape protruding, whereby it may be extracted. The part intended to pass and lodge in the stricture is gradually increased in size, until a full-sized bougie can be used without difficulty. Then the cure may be deemed complete; yet, to insure against relapse, an instrument should be passed occasionally for some time afterwards.

Sometimes a tight callous stricture is found to resist the ordinary treatment. Then the knife's edge may be used with advantage; slightly notching the contracted ring at many points, by means of a probe-pointed bistoury introduced on the finger; and afterwards proceeding with the dilatation.

Spasm of the anus may simulate organic stricture; and many of its symptoms also attend on enlargement of the prostate. Consequently, an accurate diagnosis can never be attained, without careful examination. By the frequent and forcible dejection of fluids, diarrhoea may be simulated; and a very erroneous treatment, by astringents, might be enforced, were examination of the part neglected. In most cases, the stricture is within reach of the finger; and in such, there is no difficulty; the finger's exploration removing all doubt. Sometimes, however, the contraction is higher in the bowel. And then great caution is necessary in employing the exploratory bougie; for a fold of mucous membrane, or the natural promontory of the sacrum, in a healthy bowel, may obstruct the point of the instrument for a time, more especially if this be rashly and unskilfully introduced. By disreputable empirics, indeed, such obstruction is made use of as a means of deceiving healthy patients into a belief of the existence of stricture.

Malignant stricture, or *Schirro-contracted rectum*, is by no means uncommon in the aged—and more especially in the

female ; supervening, usually, on some pre-existing affection of a simple kind ; as piles, or simple stricture. The symptoms are such as attend ordinary contraction, with the addition of copious, bloody, foetid, puriform discharge ; greater sympathy of the urinary organs ; greater difficulty and pain in defæcation ; and the ordinary constitutional cachexy which attends and characterizes malignant disease. When the verge of the anus only is affected, the diseased parts may be removed by the knife. But if the disease extend some way up the bowel, as it usually does, we must content ourselves with palliation ; assisting defæcation by enemata and laxatives ; lulling pain by opiates, applied to both the part and system. Death may take place by exhaustion. But more frequently the patient perishes under symptoms of ileus, the malignant deposit having advanced so as to cause complete occlusion of the bowel.

Medullary tumour sometimes forms between the bladder and rectum ; causing great distress ; interfering first with the functions of the rectum, and then with those of the bladder also. The treatment can only be palliative.

Irritable Rectum.

The lower bowel is liable to become the seat of Irritation, unconnected with any structural change ; causing pain, heat, itching, frequent desire to go to stool, spasm of the sphincter, and sympathy of the urinary organs. The source of irritation may be within the bowel itself ; ascarides. Or it may be contiguous ; stricture in the urethra, or stone in the bladder. Or it may be remote, yet continuous ; a depraved state of the mucous membrane of the stomach or upper bowels. Treatment is obviously to be begun by removal of the cause, if possible. Afterwards, opium, hydrocyanic acid, or other calmatives, may be applied directly to the part, by means of injection, suppository, or inunction.

Itching of the Anus, an obstinate and distressing complaint—an irritation exterior to the bowel—is of a similar nature, and requires a like treatment.

Hæmorrhage from the Rectum.

Bleeding from the lower bowel is usually an indication of piles, as has been seen ; of the internal, vascular pile, more especially ; and is almost always arterial. In females, however, it not unfrequently is found independent of prominent alteration in the bowel ; proceeding from the lining membrane, merely congested—and then usually periodic and vicarious ; or it is frequent and exhausting, proceeding from a small vascular eminence on some part of the membrane, discernible only by the use of the speculum. The treatment is obvious ; according to the cause. Hæmorrhoids are to be tied. The uterine function is to be restored, and the general frame amended. The vascular point is to be cauterized ; and astringents are at the same time given internally—the best, perhaps, the gallic acid.

Injuries of the Rectum.

The anus is liable to wound and bruise, as other parts. The former may be formidable by hæmorrhage ; the latter by inflammatory action, leading to deep-seated abscess. The treatment is accordingly. A very dangerous form of injury used to occur in hospitals, when the old syringe for the giving of enemata was recklessly used by ill-qualified administrators. The instrument's point, pushed rudely upwards, in a straight direction, is likely to lacerate the bowel. It may perforate ; and then the injection, perhaps stimulant and acrid, finds its way into the cellular tissue, causing extensive abscess and sloughing, with violent constitutional disturbance. In such cases, the remedy is to make a free and early incision into the infiltrated parts. But the modern enema-syringe, intrusted only to trustworthy hands, is not likely to lead to any such casualty.

Foreign bodies in the Rectum.

Foreign substances may lodge in the lower bowel ; causing inflammation, abscess, and ulceration there, if not removed timeously. They may be pushed upwards from without, by

accident, or by malicious design. Or they may be arrested by the sphincter in their progress downwards, having entered by the mouth; as fish bones, bones of poultry or other small animals, kernels of fruit, &c. Or they may have formed within the alimentary canal; intestinal concretions. The smaller substances are readily removed by the finger and forceps. Large bodies require previous dilatation and lubrication of the bowel; and an exploratory use of the speculum may be useful. In extreme cases of impaction, it may be necessary to divide the sphincter. In the case of rough or sharp substances, whose forcible extraction in the ordinary way might seriously injure the bowel, the speculum is first carefully introduced past the foreign body, so as to sheathe and protect the mucous membrane.

Imperforate Anus.

Children are occasionally born with the anus closed. There are three kinds of this malformation. 1. The rectum may be fully developed, and have its orifice closed by integumentary membrane only; or the canal may be obstructed by a membranous septum, at some distance from the orifice—which latter may appear in all respects normal. 2. Or the bowel is imperfect; ending in a blind *cul de sac*, at some distance from the integument of the perineum, in which there is a mere depression or vestige marking where the anus ought to be. 3. Or the rectum is almost or altogether deficient; the sigmoid flexure of the colon terminating in a *cul de sac*, at the upper part of the pelvis.

The first form is easily managed. An incision is made through the occluding membrane; and for some days a piece of dressing is interposed, to prevent union. But often this precaution will be unnecessary; the passage of meconium and fæces sufficing to keep the aperture patent.

The second variety is more common, and more troublesome. Some thickness of parts intervenes between the operator and the bowel. And at first the latter may be felt but obscurely, if at all; there being none of the bulging fluctuation which must soon be apparent in the former case. Under such circumstances, we must wait until the meconium

accumulates, and the bowel in consequence descends and is distended. It may then afford some indication of its presence to the finger from without. To assist, let firm pressure be made in the left hypogastric region; and such pressure should also be maintained, during the operation for relief. The cries of the child are of service. He is placed on the knee of a nurse or assistant, in a position as if for lithotomy. By means of a scalpel, an incision is made through the integument; and, by cautious dissection, the bulging *cul de sac* is sought for; the finger always preceding the point of the knife; the line of exploration following the natural curve of the bowel, in the hollow of the sacrum, lest the bladder or vagina should be wounded—not keeping too close upon the bone, lest the bowel be overpassed and be mistaken for the bladder—and not diverging to either side, lest the pelvic blood-vessels sustain injury. The *cul de sac*, having been reached, is opened freely by the knife; the meconium escapes; and the wound is to be kept pervious by the careful and patient use of tents—or, what is perhaps better, by the constant wearing, for some time, of a tube such as is used after lithotomy.

After even deep dissection, we may fail to meet the end of the bowel. Then it is quite warrantable, to pass a trocar and canula upwards, cautiously, in the direction in which the bowel ought to be; and, on withdrawing the trocar, we may have the satisfaction of seeing meconium follow.

Sometimes the deficient rectum opens into the vagina or bladder; constituting a *cloaca*.

Of the existence of the third variety, we are made aware, when, after waiting for days, not even the slightest indication of bulging or fulness can be detected in the perineum. A perineal wound and exploration may be made; but with scarcely a hope of success. And, failing in this, we have either to abandon the patient to its fate, or proceed to the establishment of an artificial anus.

The formation of an artificial Anus.

The question of artificially establishing an outlet for the

contents of the intestinal canal, elsewhere than in the normal site, comes to be entertained, when the rectum is congenitally deficient, and also when it has become in any way insuperably obstructed—by carcinomatous and extensive degeneration—or by the impaction of an intestinal concretion, or of some foreign substance from without. In the case of the child, probably the operation will seldom be deemed expedient; for when such a grave malformation exists—as entire deficiency of the bowel—others usually accompany it, rendering the viability of the patient under any circumstances very questionable. It were better to leave such to perish, by the original obstruction of the bowels, than to force on them a more miserable and scarcely less brief period of existence. In the case of malignant disease of the rectum, also, practitioners may well hesitate, before having recourse to a difficult and serious operation, for the purpose of attempting but a partial and temporary relief, in an affection which must at no distant period end fatally. In such a case, it would seem to be warrantable only under the following circumstances; when the general strength is not yet greatly exhausted by malignant cachexy; when the obstruction in the bowel is complete, and plainly insuperable by any direct treatment; when the patient, having had the danger of the operation, and the almost disgusting result of its success, plainly exhibited, himself decides on its performance, and is prepared to abide both the nuisance and the risk. On the other hand, when the rectum is imperviously obstructed by the impaction of foreign matter from within or from without, or by disease not malignant nor necessarily and speedily fatal, and when such obstruction is otherwise insuperable—the expediency of the operation may be safely urged upon the patient.

The sigmoid flexure of the colon is plainly the part of the intestinal canal to be reached; and it may be sought, either from before, or from behind. The former method, first proposed by M. Littré, is of easy performance; being merely a direct incision upon the part through the abdominal parietes and peritoneum, above the left groin. The operation, however, though most simple, is very hazardous to life; and, if successful, the anus is ill placed, the patient having little

or no control over its evacuation, and being the victim consequently of intense discomfort to himself as well as the source of much annoyance to those around him.

The posterior operation, proposed by Callisen, and greatly improved by Amussat, is infinitely preferable. It is performed thus:—its object being to open the bowel on its posterior part, where it is uncovered by peritoneum, and which bare space may be expected to be considerable when the bowel is much distended by its contents. The patient is laid recumbent, with the trunk bent somewhat to the right side; and with a pillow also placed beneath the abdomen, so as to make the left loin prominent. A transverse incision is made—about four inches long in the adult—midway between the last false rib and the crest of the ilium; and if any considerable obesity exist, the posterior part of the wound is crossed by a second incision, parallel to the range of the spinous processes. The different layers of fat, fascia, and muscle, are carefully divided in succession, on the outside of the border of the sacro-lumbalis and longissimus dorsi; and portions of fat, coming much in the way, may require to be removed altogether. Intestine having been exposed, some doubt may be felt as to its being the colon or not; the bulging viscus at the bottom of the deep wound may be colon, or small intestine, or kidney. From the last, manipulation and percussion will readily enough distinguish intestine. And the great may be distinguished from small intestine, by attention to the following circumstances:—the colon has its muscular fibres of greater development; the small intestines sustain a motion of alternate ascent and descent—communicated by the diaphragm, and corresponding to expiration and inspiration—while the colon is stationary, being fixed to the loins by cellular tissue; also, if two portions of bowel present themselves, that may naturally be expected to be the colon which is on the outer or spinal aspect, at the external border of the quadratus lumborum. Having become satisfied that the colon is exposed at the bottom of the wound, it is to be transfixed by a needle and ligature—at two points, above and below—so that it may not slip from its present relation to the wound, after an opening has been made, and the contents have begun to escape. The bowel, stretched by the

two ligatures drawn outwards, is divided freely between. Air and fluid contents at once escape ; but it may be necessary, by means of the finger, scoop, or forceps, to assist in the extrusion of the solid matters. The margins of the opening in the bowel are then secured by ligature to the external wound, so that, by adhesion there, a permanent, safe, and efficient aperture may be constituted for fæcal escape.

The advantages of this operation, in contrast with that of Littré, are—the peritoneum is uninjured, and the fæcal escape is more conveniently situated ; there is less risk of prolapsus of the bowel, and it is found that the control of the evacuations is infinitely greater ; indeed, a complete sphincter seems to form in the loins, rendering the occasional exhibition of aperients necessary. A pad is worn over the opening, between the periods of evacuation ; and great cleanliness must be at all times observed.

CHAPTER XXX.

CALCULOUS DISEASE.

Gravel.

URINE may deviate from the normal and healthy standard, in a variety of ways. 1. It may be *aqueous* ; the watery portion being in excess ; and this constitutes a *diuresis*. Or the opposite state may obtain ; the watery portion being deficient, the saline in excess, and the whole high-coloured and scanty. 2. It may be *mucous* ; containing an unusual amount of mucus ; which forms a cloud in the urine, on cooling—dissolved by heat ; or, if very abundant, it adheres to the bottom of the recipient vessel in a ropy gelatinous-looking mass—coagulable by acetic acid into a dense membranous substance. 3. It may be *albuminous* ; coagulable by heat and by nitric acid. And such urine may be practically considered of two kinds ; of low specific gravity, and defective in urea—indicating granular affection of the kidney, or other formidable organic disease ; or of ordinary density, without

alteration in the proportion of urea—a concomitant of febrile and of chronic affections, perfectly curable. 4. It may be *acid*; that is, showing more than the slightly acid character which healthy urine presents; and this state will usually be found dependent on uric acid or the urates. 5. It may be *alkaline*; turbid, and of ammoniacal odour; resembling, when newly passed, the result of ordinary putrescence in the stagnant fluid. This condition depends on the presence of the carbonate of ammonia; either produced by putrescence of the urine within the bladder; or directly secreted from the blood, and replacing urea. Along with this salt, there may also be the carbonates of soda or potass. 6. The urine may contain oil, fat, sugar, and other anormal substances—interesting to the general pathologist. But the depraved condition, with which the surgeon is most connected, is that wherein various *deposits* take place from the urine, either subsequently to or before its expulsion from the bladder: in the one case termed *sediment*, in the other *gravel*.

The Lithic or Uric Deposit.—This consists either of the uric acid, or of the urates tinged with colouring matter; and varies accordingly. 1. The most common is *amorphous*; consisting chiefly of the urate of ammonia, more or less coloured; of a yellow hue, when mixed with the colouring matter of the urine; reddish, when combined with the purpurate of ammonia; and when this latter ingredient is in much abundance, the sediment is of a pink colour. Such urine is unusually acid, when tested; is of high density; and has a small relative proportion of aqueous matter. When passed, it is clear; but, on cooling, the sediment is deposited more or less abundantly. 2. The *crystalline*; consisting of uric acid, variously coloured by purpuric admixture; usually of a reddish hue—the crystals resembling particles of cayenne pepper; insoluble in dilute muriatic acid; easily soluble in aqua potassæ. This is a much more formidable deposit than the amorphous; being more prone to cohere, and form stone.

Uric deposits may attend the slightest derangement of health, or the most serious; they denote a sthenic state of system, more frequently than the opposite condition. A trifling disorder of digestion, as by casual error in diet, may cause a tolerably copious sediment; the progress of hectic, and the decline of inflamma-

tory fever, are accompanied by plentiful deposit of red powder—termed *lateritious*, from its resemblance to brick-dust. The gouty diathesis is marked by uric deposit. Habitual indulgence in much animal food, with deficiency of exercise, and neglect to maintain a clean and efficient state of the skin, will not fail to establish it. It is obviously connected with climate—at least with locality; the inhabitants of certain places suffering much more than others. It is also connected with age; prevailing most, in childhood, and between the ages of forty and sixty. It is hereditary. It may follow injury of the kidney or its neighbourhood; congestion being produced in the secreting organ. It would seem to depend proximately, either on an excess of uric acid being generated in the system—by decay of effete organism, or by mal-digestion of food; or on the presence of a free acid—the muriatic, acetic, or lactic—which, combining with the base, frees the uric acid, and so leads to its precipitation. Or the causes may be stated in another way, as by Dr. G. Bird; 1. Waste of tissues more rapid than the supply; as in fever, rheumatism, &c. 2. Supply of nitrogen in the food, greater than is required for the reparation of tissues; as by excessive indulgence in animal food, and by too little exercise. 3. Digestion insufficient to assimilate an ordinary and normal supply of food; as in dyspepsia. 4. Obstruction to the cutaneous outlet for nitrogenized excretion; by skin diseases, or other cause. 6. Congestion of the kidneys; following injury of the organs, or disease wherein they are affected by sympathy.

Plainly, the treatment must vary according to the cause. In the fevers already mentioned, the deposit ceases as the constitutional symptoms subside. In other cases, the treatment may be said to be twofold. By the exhibition of alkalis, with which the uric acid combines, soluble salts are formed, while at the same time—mainly perhaps by the vehicle in which the alkali is given—the aqueous portion of the urine is increased. And by attention to regimen, exercise, and skin—going more deeply into the matter—we seek to rectify the depraved state of the digestive organs, on which the evil in the great majority of cases primarily depends. Both methods are of service; but the latter is obviously the more important. They are usually combined. Magnesia, soda, and

potass may be given. The first may accumulate in the intestines ; and on this account is seldom prescribed, at least for any length of time. The phosphate of soda is both safe and useful. The carbonate is grateful, and quite efficient. But potass is usually preferred ; its salts being more soluble than those of soda. The bicarbonate is usually given, in half drachm doses ; largely diluted ; and it may be pleasantly combined with a few grains of citric acid. The best period for administration, probably, is about two hours after the principal meals—when alkalies are most wanted to neutralize the free acid of indigestion ; and when at the same time digestion, such as it is, is sufficiently advanced as to render it unlikely that the pepsin shall be interfered with by the alkali. There are also the borate, citrate, and tartrate of potass—all available.

Simple though the alkaline remedies seem, let them never be persevered with carelessly. Their over-sustained use may convert the sthenic state of system into the asthenic, inducing serious constitutional disorder, and causing an ammoniacal and phosphatic state of the urine. The test-paper must be used from time to time, and the state of the system must be carefully attended to.

In those cases in which digestion is obviously weak and imperfect, preparations of iron are useful ; the citrate, in solution, may be given in moderate doses after each meal. Regimen is carefully attended to ; food being regulated as to both quantity and quality. Nothing at all approaching to a surfeit should ever be indulged in ; animal food should be taken sparingly, if at all ; vegetables and farinaceous articles may be freely used, provided acidity be not produced ; malt liquors should be abstained from ; and wine, if taken at all, must be used with great moderation. The bowels require laxatives or alteratives. In most cases, a mercurial purge is a good beginning of the treatment ; and, if the sthenic constitutional symptoms amount to a febrile character, cupping may be also practised on the loins. The skin must be attended to ; by ablution, warm clothing, friction, and exercise ; and if any eruption exist, means must be taken to remedy that. Occasionally, gentle diuretics would seem to be of service. Colchicum, it is well known, is a powerful eliminator of uric acid ;

and hence, probably, the main reason of its success in gout and rheumatism. When congestion of the kidney is suspected, the treatment is by cupping, rest, and antiphlogistic regimen.

The term "*gravel*" is ordinarily applied to the passing of this form of deposit—morphous or amorphous. It begins severely, and is liable to aggravations ; and these periods of intensity are termed "fits of the gravel"—characterized by pain in the lumbar region, shooting down towards the groin, with pain and retraction of the testicle ; frequent micturition, hot and scalding ; uneasy sensations in the thighs, very frequently ; more or less febrile disturbance ; and always plain indications of great derangement of the digestive organs. It is in such cases that purging, antiphlogistic regimen, and sometimes local blood-letting, form so excellent a commencement to the remedial means.

The ordinary treatment may be reduced to the following indications. 1. To diminish the uric formation ; by moderate antiphlogistics ; regulation of diet and exercise ; and attention to the skin. 2. To increase the solvent power of the urine ; by diluents, given cold—yet not so as to discourage perspiration ; and by gentle diuretics, if necessary. 3. To increase the solubility of the deposit ; by preventing or neutralizing the free acid, which, spoliative of the urate's base, causes precipitation of the uric acid ; and, by presenting a soluble base to the uric acid—the alkalies. 4. The fourth indication is one of no slight importance—to favour extrusion of the gravel ; by diuretics and diluents ; by colchicum ; by warm bathing ; and by exercise. And, in regard to this, it is well to remember, that the particles of uric gravel are especially prone to aggregation.

The Phosphatic Deposit.—The phosphate of magnesia is an ingredient of healthy urine, and is very soluble ; meeting, with ammonia, however—engendered by decomposition of urea—an insoluble salt is formed, the ammoniaco-magnesian phosphate. In certain unhealthy conditions, phosphate of lime is secreted by the kidney, and copiously by the mucous coat of the bladder.

These phosphates constitute this class of deposit ; sometimes, but rarely, consisting of phosphate of lime ; very fre-

quently of the ammoniaco-magnesian phosphate ; and often of a combination of this latter salt with the former.

The phosphatic gravel is usually white or pale-grey ; it may be either amorphous or crystalline ; it may be precipitated in the form of plain gravel, or it may be either suspended or precipitated in a cloud resembling that of mucus, or it may form as a pellicle on the surface of the urine ; "it is insoluble in aqua potassæ, but easily soluble in the diluted muriatic or acetic acids. If ammonia be evolved under the action of potash, it contains the ammoniaco-magnesian phosphate ; if not, it contains only phosphate of lime."* The urine is pale and copious ; of low density ; occasionally alkalescent, when voided ; never more than very faintly acid ; often turbid, the last portion which is voided presenting a milky appearance—the phosphates being already precipitated ; sometimes it emits a heavy, sickening flavour, somewhat similar to that of weak broth ; not unfrequently it is ammoniacal from the first, dark-coloured, and loaded with mucus ; in all cases, it very soon putrefies, precipitating the deposit copiously, and exhaling a very offensive odour. Very generally, an iridescent pellicle forms on its surface ; consisting of minute shining crystals of the ammoniaco-magnesian phosphate.

The symptoms which attend the continuance of phosphatic deposit, are invariably of the asthenic type. The patient is pale, weak, nervous, irritable ; incapable of sustained exertion of either body or mind ; the bowels are flatulent and irregular ; and an oppressive, exhausting pain, or aching, is almost constantly complained of in the loins.

The cause may be local or constitutional. Whatever tends to exhaust the general, and more especially the nervous system, tends to induce this deposit ; over-exertion, especially of mind ; insufficient food ; the habitual use of depressing medicines, as mercury, alkalis, saline purgatives. Also, this deposit is a frequent consequence of injured kidney, and of injury to the spine ; and it is an almost invariable attendant on confirmed disease—more especially if organic—in the bladder, kidney, ureter, or prostate. An occasional deposit of phosphates may follow a slight and transient cause ; as error

* CHRISTISON.

in diet, or profuse perspiration under violent exercise. But continuance invariably denotes broken health. The least formidable cases are those in which the ammoniaco-magnesian phosphate alone is found ; and the worst are usually those in which the deposit consists of a combination of this salt with the phosphate of lime.

Happily, the phosphatic gravel is not prone to agglomerate within the bladder, unless a nucleus be present ; then, however, the cohesion of particles, around this, takes place rapidly.

In treatment—as in that of the uric deposit—we have to direct attention both to the deposit, and to the causes which lead to its formation. The mineral acids—as the muriatic, nitric, or a combination of both—exert a double influence ; they increase the solubility of the phosphates, and at the same time give tone to the primæ viæ and general system. They are given in doses of a few drops, much diluted, and gradually increased. Regimen is carefully attended to. Food should be generous, yet light and moderate ; consisting chiefly of solids. Acescent vegetables, fruits, and drinks are injurious ; for, however useful the mineral acids, taken from without, may be, acids engendered within invariably betoken derangement of stomach, and that as invariably reacts most untowardly on the urinary organs. Wine may be taken sparingly. Over-exertion in any way is avoided ; free air and laxity of occupation are to be sought ; and the skin's function must be well looked to. The bowels are regulated ; but mercury and saline purges do harm. Diuretics are not given ; neither are alkalies—unless indeed the acids of indigestion plainly are troublesome, and then very small and occasional doses of alkali may be of service. Depletion, in any way, is not to be thought of. Opium is of much service ; by subduing the irritability of system. General tonics are plainly indicated. And the decoctions of the *diosma crenata*, *pareira brava*, and *uva ursi*, would seem to exert a beneficial influence specially on the urinary system.

The Oxalic Diathesis.—Gravel properly consists of either of the foregoing deposits ; the uric or the phosphatic ; the red or the white sand. But there is another morbid state, in which there is tendency to deposit within the bladder, if a

nucleus exist ; although the urine itself, when extruded, is clear, and lets fall little or no sediment. The urine is of low density ; pale ; sometimes, but rarely, of a greenish hue. The deposit, occurring around a nucleus, is oxalate of lime ; it is "commonly brown, ash-grey, or bluish ; compact, occasionally crystalline ; sometimes tuberculated ; soluble in dilute nitric acid, scarcely soluble in dilute muriatic acid, insoluble in acetic acid, insoluble in aqua potassæ." Small calculi are sometimes passed, consisting of oxalate of lime, and closely resembling hemp-seed in appearance. They have doubtless formed in the kidney, and been expelled by the urethra after a very short residence in the bladder.

From no deposit taking place in the ordinary state of matters, the oxalic diathesis is more likely to escape observation than the uric or phosphatic. The salt is detected, readily enough, however, by exposing a portion of the urine—especially if previously condensed by evaporation—to examination by the microscope ; when the peculiar octohedral crystals are seen, with sharply defined edges and angles. Sometimes they resemble minute cubes, adherent like blood discs ; in a few rare cases they may be found very remarkable, "shaped like dumb-bells, or rather like two kidneys with their concavities opposed, and sometimes so closely approximated as to appear circular." "When the oxalate is allowed to dry on a plate of glass, and then examined, each crystal is found to resemble two concentric cubes, with their angles and sides opposed, the inner one looking transparent, and the outer black, so that each resembles a translucent cube set in a black frame."* The chemical examination of urine suspected to be oxalic, is conducted by decanting the upper portion of urine which has rested after being passed, warming a portion of the remainder in a watch-glass, and moving it gently ; the oxalate is deposited in crystals at the bottom ; and on removing the greater part of the fluid by means of a pipette, and replacing it with distilled water, a white powder becomes visible, showing the characteristic crystals.

The attendant constitutional symptoms resemble those of the phosphatic diathesis. The patient is languid, weak, and

* GOLDING BIRD ; a gentleman who has done much to elucidate this interesting department of pathology.

thin ; often remarkably depressed in spirits ; usually pale, sometimes of a greenish hue in the face—more especially about the eyes and mouth ; pustular formations on the skin are common ; and so are scaly eruptions ; the slightest exertion induces great fatigue ; the temper is irritable ; the mind broods over the ailment, and desponds of recovery ; dyspepsia is present—troublesome, by flatulence and palpitation, more especially after taking food ; aching pain is complained of across the loins ; and the sexual power is usually much impaired. Sometimes the symptoms of phthisis are simulated ; sometimes those of heart disease. Not unfrequently, water is made with unusual frequency, and with heat and smarting.

The ordinary causes of this affection are, over-exertion of mind or body, excess of venereal indulgence, habitual and gross errors of diet, exposure to cold, injuries done to the lower part of the spine. The oxalic acid would seem to be the product of faulty assimilation ; and it readily meets with its base. According to some, the acid may be introduced from without ; it being supposed to be one of those substances which are capable of passing unchanged from the stomach to the kidneys. According to this view, the use of rhubarb, sorrel, tomata, &c. as articles of food, along with the use of hard water as drink, may be deemed very favourable for the establishment of the oxalate of lime deposit.

The treatment also resembles that for the phosphatic diathesis. The general functions are looked to ; but more especially those of the stomach and skin. Diet is light and nourishing. Malt liquor is forbidden ; and a sparing allowance of brandy and water, with meals, is found preferable to wine. Sugar is to be avoided. Warm clothing must be worn ; and by friction, exercise, and warm bathing, the pores are to be kept free. All sources of exhaustion, and all kinds of depletion are to be avoided. Medicinally, the mineral acids are found of much service ; especially the nitro-muriatic, exhibited in some bitter infusion. And, of the tonics, zinc and iron are to be preferred ; the sulphate of zinc more especially. Colchicum, too, is found useful. It is well to remember that, in treatment, the oxalic often changes into the uric diathesis ; indeed it is probable that these two morbid states readily pass into each other—it costing the urea,

as it were, but little effort to change into either the uric or the oxalic acids. When, under treatment, the uric deposit is observed to succeed the oxalic, the use of the acids must be abstained from, at least for a time.

Such are the morbid conditions of the urine, which it is the business of the practitioner timeously to detect, and by suitable treatment to correct; so preventing the hazard of aggregation of the particles within the body, and the formation of urinary calculus. The oxalic diathesis, we have seen, is to be noted chiefly by the general symptoms and by microscopical examination of the urine. The uric and phosphatic, on the other hand, are more easily and readily discovered by attention to the nature of the deposit. And, in this important practical department, the following plain rules are of service. The cloud caused by the urate of ammonia is readily dispelled by heat; and the deposit is also dissolved by liquor-ammoniaë and liquor-potassæ. Uric acid is not so dissolved by heat; on the contrary, it becomes more distinct, the alkaline urates present being dissolved; it is not dissolved by muriatic acid; but it is dissolved when heated with liquor potassæ. The phosphates are not changed by heat, but are dissolved by dilute muriatic acid, while they are insoluble in liquor-ammoniaë and liquor-potassæ. Mucus and pus are distinguished from the phosphates, by not being dissolved by muriatic acid; and from the urates, by not disappearing on the application of heat. Pus and mucus, also, are distinguished from each other thus:—When the latter substance is mixed with acetic acid, “the fluid part of the mucus coagulates into a thin, semi-opaque, corrugated membrane,” peculiar and characteristic. Pus is not so affected by acetic acid; but, “agitated with an equal quantity of liquor-potassæ, it forms a dense, translucent, gelatinous or mucous mass, often so solid that the tube can be inverted without any escaping.”

Urinary Calculi.

These are formed by aggregation of the particles of deposit around a nucleus. The nucleus may come from within or

from without. A foreign substance introduced into the bladder, by the urethra, by wound, or by ulceration, and remaining in that viscus, soon becomes coated by calculous matter, even though previously no tendency to such deposit existed. Barley-corns, straws, portions of bougies, may thus prove nuclei ; also portions of instruments, lint, or other matters, used in operations on the bladder ; or a portion of necrosed bone may find its way, by ulceration and abscess, into the viscus. By far the most common nucleus, however, is provided by the urinary organs themselves. A few particles of uric acid, or of oxalate of lime—for these, the former more especially, are found to be most prone to formation in the kidney—become coherent immediately after secretion ; and by such aggregation a nucleus is at once formed, soliciting further addition. This addition may be made at the original site of aggregation, the kidney ; more frequently, however, descent takes place into the bladder ; and the small renal concretion then becomes the nucleus of a vesical calculus. Or, blood, escaped from the kidney or mucous coat of the bladder, may afford a mass of fibrin, which in like manner may originate the untoward formation ; all the more readily, of course, if a gravellish tendency previously exist. As the stone enlarges, the original nucleus usually retains its central position ; the stone moving loosely in the bladder, and receiving addition equally on all sides. Sometimes, however, the stone is found to occupy a steady position, even when not encysted ; lying undisturbed behind an enlarged prostate, having one side in constant and immediate contact with the mucous membrane, and presenting only a part of its periphery to the source of additional deposit. In such cases, the nucleus will be found occupying a lateral position in the stone's section ; enlargement having taken place almost exclusively on that aspect which looked into the free interior of the viscus.

Stones vary in their nature according to the diathesis which prevails during their formation. The following are the varieties :—

I. *The Uric Calculus* ; consisting chiefly of uric acid, but containing a greater or less proportion of urate of ammonia. This is by far the most common class ; comprising probably about two-thirds of all calculi. The colour is brownish red,

sometimes like that of mahogany ; the surface is either quite smooth, or finely tuberculated by crystals of urate of ammonia ; a section shows aggregation of the particles in a concentric arrangement ; the form is generally oval ; and the size may vary from that of a pea to that of an orange. The tests are—solubility in caustic potass ; gradual consumption before the blow-pipe ; digestion in nitric acid, and gentle evaporation, producing a scarlet residue, which becomes purple on the addition of ammonia.

II. *Urate of Ammonia Calculus*.—This salt, as just stated, enters more or less into the construction of the uric calculi. Sometimes, but rarely, it forms a concretion by itself. The surface is similar to that of the uric ; more frequently tuberculated than smooth ; it is of a clay colour ; the fracture is fine and earthy ; and the layers are concentric. This comparatively rare calculus is peculiar to children. The tests are as for the preceding ; with this addition, that ammonia is evolved during solution in potass.

III. *The Oxalate of Lime, or Mulberry, Calculus* ; not unlike a mulberry in size, form, and colour. By no means unfrequent, especially in young people ; always of slow formation. The colour is dark brown ; density and weight are comparatively great ; the surface is almost always rudely tuberculated ; the texture is imperfectly laminated ; the size seldom exceeds that of a walnut ; and the stone is always single. The tests are :—solution in nitric acid ; the blow-pipe, consuming the acid, leaves quick-lime in powder, which, if moistened, gives to turmeric paper a red stain. The smooth hemp-seed calculus, as already stated, is of renal origin. If one remain in the bladder, it becomes variously coated, according to the diathesis that prevails. If the oxalic diathesis continue, the hemp-seed sooner or later passes into the mulberry formation.

IV. *Phosphate of Lime Calculus*.—Calculi seldom consist of this salt alone. When they do, the surface is smooth like that of porcelain ; the colour is a pale brown ; the texture is regularly laminated ; the form is spheroidal. The stone is friable, and usually of small size. The tests are ; solubility in nitric and muriatic acids, and precipitation by liquor am-

moniaë ; resistance to the blowpipe, unless at a very intense heat.

V. *The Ammoniaco-Magnesian Phosphate Calculus* ; commonly called the Triple Phosphate Calculus—although that term might with fully as much accuracy be applied to the next variety. This and the following seldom occur as composing stones entirely ; but rather as coatings or layers of others—the uric and oxalate of lime more especially. The colour is nearly white ; the surface is covered with minute shining crystals ; the texture is not laminated, or at least is imperfectly laminated ; the stone is soft, easily broken and pulverized, and may attain to a large size. The tests are ; solubility in acetic or muriatic acid ; evolution of ammonia, when treated with liquor potassæ ; diminution and imperfect fusion under the blowpipe, exhaling an ammoniacal odour.

VI. *The Fusible Calculus* ; composed of the ammoniaco-magnesian phosphate, conjoined with phosphate of lime ; is white and friable, like chalk ; and may stain the finger when touched ; the size and form are very various. The test is, its remarkable fusibility before the blowpipe.

VII. *The Carbonate of Lime Calculus*, is common in the lower animals, but rare in man. It is white, spherical, smooth, and very friable ; and dissolves in muriatic acid, with effervescence.

VIII. *The Cystic Oxide Calculus* is also rare ; of a yellowish-white colour ; the surface smooth, but of a crystallized appearance ; not laminated in texture, but presenting the appearance of a confusedly crystallized mass ; the fracture exhibits a peculiar shining lustre ; small fragments are semi-transparent. The blowpipe elicits a peculiar odour, like that of sulphuret of carbon ; and there is a ready solubility in alkalis and dilute mineral acids.

IX. *The Xanthic Oxide Calculus* is still more rare than either of the preceding. The texture is compact, hard, and laminated ; the surface is smooth, the shape ovoid, the colour cinnamon-brown. The tests are, consumption before the blowpipe, leaving a white ash, and exhaling a peculiar foetid odour ; solubility in acids and alkalis—more readily in the latter ; the residue of solution in nitric acid, evaporated

to dryness, of a bright lemon-yellow colour—whence the name.

X. *The Lithate of Soda* sometimes enters into the composition of calculi ; but very rarely constitutes a calculus, of itself. The mass is white, friable, and soft, like what is seen in the tophous concretions of gout, in the neighbourhood of joints. The tests are ; solubility in caustic potash, with the aid of heat ; in treatment with dilute sulphuric or muriatic acids, the soda is separated, while the uric acid remains, and may be obtained by filtration and washing.

XI. *The Fibrinous Calculus*, like the xanthic oxide, occurs with extreme rarity. And, perhaps, the term calculus is scarcely applicable to the almost solitary case on record ; in which small concretions were passed, of the size of peas, yellow, like wax, and composed of fibrin—probably the result of a bloody clot, in either the kidney or bladder. Such formations, however, as already stated, may not unfrequently constitute nuclei of the ordinary calculi.

XII. *The Alternating Calculus*, though last in the arrangement, is not the least frequent in occurrence. Few large calculi, indeed, fail to present more or less of the alternating character ; the nucleus consisting of uric acid or oxalate of lime ; variously coated or alternated ; the last covering invariably phosphatic, and most frequently of the nature of fusible calculus. The mulberry or uric calculus, having formed, creates much irritation in the urinary organs, and causes changes also in the general system for the worse ; the urinary secretion becomes more and more depraved ; and at last that derangement is produced which is favourable to the formation of the ammoniaco-magnesian phosphate ; this is deposited on the growing stone, and, uniting with phosphate of lime now furnished by the diseased mucous membrane of the bladder, constitutes the fusible formation.

Such are the varieties of Urinary Calculi. Those ordinarily occurring are, the uric, mulberry, phosphatic, and alternating. Forming in the kidney, and remaining there, a calculus is said to be Renal ; originating in the bladder, or growing there after descent from the kidney, it is said to be Vesical ; originating in the urethra, or arrested there in its passage out-

wards from the bladder, it is said to be Urethral ; formed in the prostatic ducts, it is said to be Prostatic.

Stone is most common in temperate climates, and in early years ; of adults, the old are more frequently attacked than the young. The sedentary are more liable than the active, the luxurious than the temperate, the males than the females. Certain districts are remarkably prolific in stone ; Norfolk, for example ; and the east coast of Scotland. The disease is doubtless hereditary, like its kindred affection, gout ; and this circumstance may obviously be made somewhat subservient to the explanation of prevalence in certain localities. Frequency of occurrence leads to skilful practitioners and the flocking of patients ; the patients recover, and raise a breed of men of like tendencies as themselves. Where the disease is rare, on the other hand, the treatment is less skilful ; the affected migrate, and the chance of reproduction from those who remain is but slight.

Injuries of the spine obviously favour alkaline formations ; causing perversion of function, in the kidney, and in the lining membrane of the bladder, with want of expulsive, or self-cleaning power in the latter viscus. An injury done to the kidney itself also favours stone ; by disordering secretion, and at the same time furnishing coagula as nuclei for the formation. Long-continued strictures, and affection of the prostate, are obviously predisposing causes ; deteriorating the secretion of urine—through disorder of the general health, and prolongation of irritation from the original seat of disease, upwards to the kidney ; at the same time opposing satisfactory expulsion of the bladder's contents. Some children seem born with stone ; afflicted with a congenital calculous diathesis.

The treatment of calculous disease plainly resolves itself into the following indications. 1. To prevent the formation of stone, by correction of the calculous diathesis. 2. To favour spontaneous expulsion of the stone, when formed. 3. To diminish suffering, and delay progress of the disease. 4. To remove the stone by operation, when circumstances are favourable. 5. Unfortunately we are not yet warranted in filling up as a fifth indication, removal of the stone by lithontriptics, or other means independent of instruments.

Renal Calculi.

Renal calculi at first consist either of uric acid, or of oxalate of lime; most frequently of the former. Particles cohere, either simply to each other, or around a nucleus of fibrin or other animal substance. And a beginning having been made, however slight, addition speedily takes place, provided the calculous diathesis continue—as is not unlikely, seeing that the irritation of the calculus reacts unfavourably on the kidney, causing continuance or even increase of depraved secretion. Mere sand may remain in the tubuli; but calculi lodge in the infundibula; and thence may descend to the pelvis of the kidney. And if a calculus continue in any of these cavities for some time, a peculiarity of shape is acquired—diagnostic of such formations—dependent on the form of the cavity; in fact, the stone—though at first small, oval, and smooth, like uric calculi in general—may often be said to be an accurate cast of the pelvis and infundibula. This happens when the calculus continues to be renal; more frequently it descends by the ureter to the bladder; thence to be expelled by the urethra, or to enlarge into a vesical calculus. If it remain in the kidney, serious changes take place in that organ. The cavity or cavities are completely occupied; then, the size increasing, encroachment by pressure is made on the texture of the gland, until this may come to consist of little more than a mere cyst within which the large stone is contained. Sometimes, active inflammatory action is kindled; the kidney suppurates; the matter, obeying the general rule of seeking the external surface, may point posteriorly; and, evacuation having taken place, the stone may be felt by the probe or finger.

The symptoms of stone in the kidney are generally as follows:—A dull aching, with a sensation of weight, is felt in the loins; with a sharp pricking feeling in the region of the kidney. Sometimes there is pain in the scrobiculus cordis; sometimes there are fits of vomiting; generally, the stomach is irritable. The urine, from time to time, shows an admixture of blood, more especially after exercise; and this, when rude and violent, aggravates all the symptoms. Water is made often, and with pain and heat; the testicles are pain-

ful and retracted. Numbness, pain, and cramp in the corresponding thigh are very common. Febrile aggravations are liable to occur, the kidney becoming the subject of intercurrent seizures of an inflammatory nature. Purulent matter may descend from the pelvis, and be voided with the urine; and by continuance of such discharge, by the hæmaturia, by the pain and general disorder, serious exhaustion may ensue. Generally, the irritation descends; and the bladder ultimately sympathizes more or less, by functional or organic disorder. Large calculi, occupying the whole gland, may sometimes be felt by external manipulation; and, in the open suppurated condition, a very accurate diagnosis may be arrived at, as already stated.

Generally the stone, at no long period after its first formation, descends by the ureter; this movement being induced by its own weight, and by the flow of urine. Sometimes, however, it is arrested in the ureter; an event towards which the irregular form of the calculus is manifestly favourable. The ureter may be, in consequence, either wholly or partially obstructed. Usually, the form of the calculus is such as to favour the urine's escape by its side; but still even such partial obstruction, if long continued, may lead to very serious results; dilatation of the ureter above, of the pelvis, and of the infundibula; absorption of the proper structure of the kidney; and consequent interruption to the function of that important organ. Indeed, under such circumstances, the parts have been found reduced to the condition of a chronic abscess; the distended pelvis and infundibula being coated with a false membrane, and secreting much puriform fluid. And other dangers attend on the arrest; inflammatory action, kindled in the obstructed part, may extend to the parts adjoining, and may involve the abdomen in peritonitis; or ulceration may take place, with perforation; and through the aperture fatal urinary extravasation may occur. Complete obstruction by the arrest is fraught with the utmost peril; distension of the pelvis and infundibula, rapid and great, is likely to cause suppression of urine—always most hazardous; there is a greater risk of inflammation and ulceration than in the partial case; the over-distended ureter may even give way by bursting. In the case of the partial obstruction there is a chance—

though a remote one—of the ulceration proving chronic and sthenic ; preceded and accompanied by plastic exudation, and consequent consolidation of tissues ; advancing towards the surface ; and ultimately discharging the offending body externally. Or the calculus may remain in the ureter, with partial obstruction ; as it enlarges, it usually assumes the form of an hour-glass, the increase of deposit taking place chiefly at either extremity ; and sooner or later death is the result. Not unfrequently, a descending stone is arrested in the termination of the ureter ; one part within the ureter, partially obstructing it ; the other projecting into the cavity of the bladder, and receiving increase there ; constituting a troublesome variety of vesical calculus.

A small, smooth calculus may glide down the ureter imperceptibly. More frequently, descent is marked by symptoms. The patient is sick and vomits ; he is alarmed, feeling a change, and afraid of the result ; he is attacked by cold chills and shivering ; the pain shifts from the kidney, shoots downwards in the course of the ureter, and often down the corresponding thigh—intense, and sometimes almost insupportable ; the testicle is retracted and painful—the seat of neuralgia, or irritation ; sometimes the irritation induces the inflammatory process, and acute orchitis results. The pulse is comparatively little affected—the general disorder being also that of irritation ; but it too may give way ultimately to inflammatory fever, in consequence of inflammatory seizure in the ureter, kidney, bladder, or testicle. If arrest and obstruction take place, all the symptoms are much aggravated ; and the inflammatory risks become greatly more imminent.

The treatment of renal calculus consists in favouring descent, and palliating the urgency of the symptoms. The warm bath relaxes ; opium does the same, and assuages pain ; purgatives and diuretics favour descent. Smart exercise is also of service. In the first instance, antiphlogistics are not demanded ; they are held in readiness for the threatening of inflammatory seizure. Not the least important part of the treatment is, the adoption and maintenance of such means as are best suited for overcoming the diathesis on which the existence of the stone depends. Should there be reason to apprehend arrest in the ureter, with complete or even great ob-

struction, diuretics and diluents will of course be refrained from. When, however, descent has been completed, and the bladder is reached, diluents can hardly be plied too actively, so as to favour complete expulsion of the foreign body.

When a large stone lodges in the kidney, and its presence can be made out with tolerable certainty, nephrotomy has been proposed ; cutting into the gland from behind, and extracting the stone. This is not warrantable, however, except in those cases in which Nature has effected the greater part of the procedure ; when suppuration has taken place ; when the textures intervening between the stone and surface are matted together and consolidated ; when the stone has become superficial ; and when, in short, there is no risk of injury being done to the abdominal cavity by posterior incision. Then the pointing abscess may be opened, or the aperture already existing may be enlarged, and the stone may be seized and removed. Such cases, however, are very rare, as can readily be understood.

Vesical Calculus.

As already stated, the vesical calculus may originate in the bladder, formed on a nucleus there. More frequently, it may be said to be a continuation of the renal concretion. On descent having been completed, the sufferings which accompanied it generally cease ; the patient enjoys a period of great comfort ; and he is apt to imagine himself rid of the malady. Uneasiness, however, returns ; and in no long time the symptoms of stone in the bladder become marked and characteristic. The water is passed with unusual frequency, and with more or less pain. The desire to evacuate the bladder is not only frequent, but sudden and irresistible ; and the evacuation does not bring relief. On the contrary, the pain, which existed during micturition, is aggravated when the bladder is empty, and when the spasmodic contraction of the middle coat brings the morbidly sensitive mucous membrane into direct and rude contact with the calculus. The pain is referred chiefly to the point of the penis, with a sensation as if something lodged there ; and, in consequence, the prepuce and end of the glans are liable to be pinched and pulled by the

patient involuntarily. This especially takes place in children ; and in them it is very common to observe the fore-finger and thumb pale and sodden in their points, like those of a washer-woman. We may find elongation and œdema of the prepuce, from the same cause. A slight change of posture may induce the desire for micturition. It is sure to be induced and aggravated, as well as the pain, by exercise ; more especially, by being roughly jolted in a cart or other carriage ; and then, too, we may expect the urine which is passed to be more or less bloody. A stooping posture is usually adopted during micturition ; sometimes the patient rests on his knees and elbows ; sometimes he leans over and rests on his head ; the object being to avert pain, by removing the calculus from the most sensitive part of the bladder—the trigone. The water at first may flow in full stream, and then it may stop suddenly ; the stone having moved to the orifice of the urethra, and temporarily occluded it, causing aggravation of pain. By change of posture, the stone is dislodged, and the ready flow is restored. The stone, acting constantly as a source of irritation to the lining membrane of the bladder, induces congestion there ; increase and change in the secretion result ; mucus coming in greater quantity, and more viscid than usual ;—a wise provision, the tenacious mucus adhering to the membrane which secreted it, and protecting it, to some extent, from injurious contact with the calculus ; what is redundant, is discharged with the urine. And hence a common symptom of stone is, the presence of such mucus in the urine ; settling down in the bottom of the recipient vessel, and often showing itself there in great quantity, on the supernatant fluid being poured off. If a chronic inflammatory process have been lit up in the inner coat, the mucus degenerates still farther, and resembles purulent matter. If true inflammation have occurred, and the membrane have ulcerated, the urine will contain more or less of true pus. And, under such circumstances, the urine will generally be found, dark-coloured, turbid, alkaline, and fœtid. The rectum sympathizes, more especially in children ; the bowel becomes irritable ; or hæmorrhoids form ; or prolapsus ani occurs. Frequently there is sympathetic uneasiness elsewhere ; the testicles may be tender and retracted, from time to time ; pain

often shoots down the thighs ; and unpleasant heat is sometimes complained of in the soles of the feet.

The symptoms are not uniformly severe, but are liable to remissions and exacerbations ; the latter, termed " fits of the stone," are attended with great agony—as the self-performed operations of the blacksmith of Amsterdam and the cooper of Königsberg abundantly testify. They are induced by exercise, error in diet, or constitutional disorder ; and the greater part of the suffering, it is probable, is directly dependent on spasm of the muscular coat of the bladder. The symptoms also vary according to peculiarity of constitution. One patient may suffer intensely, enjoying scarcely a moment's ease ; while another complains but little, and follows his usual avocations, scarcely disturbed ; and yet the local circumstances may be very similar in both. And again, a variety in suffering is found to depend very much on the nature of the stone and the diathesis. The mulberry occasions more uneasiness than the smooth uric concretion ; the rough and sharp nodules of the former coming into frequent and injurious contact with the lining membrane of the bladder. And the phosphatic stone will probably occasion more suffering than either ; the general system being more deranged, as well as the mucous membrane ; and both being consequently prone to an unusual resenting of the stone's stimulus ; in other words, both the general and the local sensibility are morbidly increased. Also, with a varying diathesis, the intensity of the symptoms will vary. The uric concretion at first gives little trouble ; but it becomes coated with oxalate of lime, and increase of pain may come with the formation of nodules ; again the uric diathesis prevails, the rough eminences are levelled by the new deposit, the surface once more is smooth, or at least even, and a remission in the symptoms is experienced. But, then the phosphatic diathesis ensues ; both kidneys and bladder are advancing untowardly in disease ; a layer is forming of the ammoniaco-magnesian phosphate, or of the fusible calculus ; and the symptoms are more severe than they have yet been. For not only is there aggravation of the symptoms strictly local ; the constitution also suffers, and that seriously.

By supervention of enlargement of the prostate, the symp-

toms may be either mitigated or increased. If the gland simply increase in bulk, the former result may take place ; the gland coming to occupy the most sensitive part of the bladder, and consequently saving that from contact with the stone. But if the gland be ulcerated towards the bladder, and the stone rest in contact with the ulcerated surface, suffering will be greatly aggravated.

The most ordinary and diagnostic signs of stone are : the frequent, sudden, irresistible, unrelieved desire to make water ; the pain at the point of the penis, after the bladder is empty ; mucous urine, occasionally bloody ; occasional stopping of the flow of urine, and restoration of the flow by change of posture. These fully warrant the surgeon in suspecting the existence of vesical calculus, and in adopting the necessary means to detect it ; but they, of themselves, never prove the existence of stone. The general symptoms of stone—and even these, the most pointed of them—may be very closely simulated by other affections ; by organic disease of the kidney, by renal calculus, by irritation or organic disease in the rectum, by disease of the coats of the bladder, by prostatic affection, by stricture of the urethra. Certainty can never be arrived at without the use of the sound.

The continued irritation, by the stone's presence, induces serious change in the coats of the bladder. The mucous membrane, as already seen, becomes congested, and sustains perversion of its secretion—the mucus at first viscid and clear, afterwards discoloured and phosphatic. By a chronic inflammatory process it may be thickened ; by true inflammation it may ulcerate, discharging pus copiously. The muscular coat, under the frequent stimulus to contract, and the frequent obedience to that stimulus by violent and spasmodic contraction, becomes hypertrophied ; after death, the fasciculi are seen coursing in their interlacements, salient and strong, with depressions between. The cavity of the viscus is contracted ; and such diminution in capacity is usually proportioned to the increase of bulk in the muscular fibre. Between the fasciculi, the depressions get deeper and deeper ; and very frequently, the mucous coat becomes protruded outwards, so as to form pouches or sacs, of greater or less size ; within which a calculus may become embayed, or a fresh concretion may

form. Abscess may occur between the coats ; usually discharging itself into the viscus ; sometimes opening outwards, by perforation, into the cavity of the peritoneum, or into the deep cellular tissue of the pelvis—either event most hazardous—or into the rectum. And thus, in three ways, a cavity may be produced for the encystment of calculus ; by internal opening of a parietal abscess ; by hernial protrusion of the mucous coat, outwards, through the muscular ; by deepening and enlargement of a depression between the hypertrophied fasciculi. The inflammatory process may invade the whole coats ; chronic or acute. Gangrene has sometimes occurred ; ulceration and abscess are not unfrequent. In the aged, chronic cystitis is almost inevitable ; the phosphatic mucus, which attends this affection, increases the growth of the stone ; and phosphatic deposit, becoming entangled in the viscid mucus which adheres to the lining membrane, may lay the foundation of other concretions, or constitute a broad adherent layer of calculous matter. The prostate sooner or later becomes enlarged, in those advanced in years. The kidneys suffer more and more by derangement of function ; ultimately organic disease is not improbably produced. And under such advancement in disease and suffering, it need not surprise us that the general issue of the disease is death. At the same time, it is not to be forgotten, that many a patient, with large stone, bulky prostate, and diseased bladder, lives for many years, and may die of an ailment with which the stone is unconnected.

The effects of time on the stone itself are important. The most obvious is enlargement ; slow, in the case of the mulberry ; in the uric, seldom rapid ; in the phosphatic, rapid and untoward. And, be it remembered, that whatever the nature of the original concretion be, its ultimate coatings will be phosphatic, if it remain long ; its irritation never failing to induce the phosphatic depravity of secretion, in the kidney and in the mucous coat of the bladder. By sacculation, an opportunity is afforded for encystment. And if this take place, the symptoms are all mitigated—may, indeed, wholly disappear. But the stone slowly receives addition within the pouch ; and probably will come to project through the aperture of communication. On such projecting portion, deposit takes

place with greater rapidity ; and then we expect the symptoms of stone to be revived more or less intensely. Occasionally, the stone undergoes spontaneous disruption ; sometimes after unusual violence of exercise, sometimes in connexion with no assignable cause. In such cases, the stone is usually phosphatic ; the particles being more loosely aggregated than in the uric or mulberry concretions. The event is always to be regarded as untoward. Indeed, unless speedy relief be afforded by our art, the issue is almost certainly fatal. The sharp irregular fragments inflict great injury on the urinary organs ; some may obstruct the urethra, causing retention of urine, with its various calamitous results ; the rest excite cystitis, acute and intense ; the bladder becomes filled with coagulated blood, and from this cause a formidable retention of urine may result ; the kidneys sympathize ; and, under a complication of disorders, the system is apt to be overborne. Lately a case occurred under my observation, in which the immediate perils of retention by coagula in the bladder were got over, as also the first brunt of the cystitis ; but, at the end of the third week, the patient perished by abdominal peritonitis, found to result from extravasation of urine through perforating ulcer of the bladder.

In a few very rare cases, ulceration of the coats of the bladder has had the happy effect of permitting spontaneous extrusion of the stone ; through the abdominal parietes, in the hypogastric region ; into the rectum ; or into the vagina. But such a result, so rare, hazardous, and improbable, manifestly cannot be taken into account in consideration of the treatment.

Treatment of Stone in the Bladder.

No treatment can be adopted with propriety, until an absolute assurance has been obtained of the existence of stone. And this can only be secured, as already stated, by *Sounding* ; a simple operation, yet one requiring tact and care in its performance. The introduction of an instrument by the urethra, and its movement in the bladder during perquisition, must always be attended with more or less suffering ; and there must always be a greater or less risk of undue excite-

ment following. It can readily be understood how the careless and rude use of a sound, in an irritable bladder and patient—had recourse to after walking, or travelling in any way, and not protected by rest and suitable treatment afterwards—may induce a most serious cystitis, with implication of the kidney ; and it is salutary to remember that a cystitis, thus caused, has once and again proved fatal. A patient—say from the country, and just arrived—presenting himself with the ordinary symptoms of stone, is not at once to be sounded, and at once dismissed. We must first ascertain that pulse, kidney, and bladder are sufficiently quiet to admit of this operation being practised with impunity ; and, after its performance, rest must certainly be enjoined for some time, perhaps with sedative, or even antiphlogistic treatment. It is in itself an important operation, and must be regarded as such.

The instrument is of steel, of medium size, straight till within two inches of the extremity—where it is sharply curved—and furnished with a broad and smooth steel handle. Of steel, and broad in the handle, so that its impingement on the calculus may be the more distinctly felt ; and of a sharp, short curve at its end, so that, the straight portion being in the urethra, while the whole of the curve is within the bladder, the end may be moved about in that viscus freely, and in all directions ; of medium size—not so large as to be grasped tightly by the urethra, and so be limited in its movements—and yet large enough to afford a steady grasp to the operator, with surface enough for ready striking of the stone. The bladder should be as much distended by retained urine as the patient can conveniently bear ; so as to afford room for the instrument's play. The patient is placed recumbent ; and, the sound having been gently introduced, the convexity of its curve is pressed in the direction of the ordinary site of stone—at the most dependent part of the bladder, behind the prostate. There, a hard substance being felt, the instrument is moved sharply, with a striking movement ; and, in addition to the rub which was at first conveyed to the operator's hand, a distinct *click* will be heard, and a more defined and vivid impression of impingement on a foreign body will be felt. And without this combined indication of touch and hearing,

the surgeon should never be satisfied of the existence of stone. If nothing be found in the ordinary site, the instrument's point must then be moved carefully and inquiringly in every direction ; groping at first, as a probe ; and, on finding resistance, moved with a sharp yet gentle strike. Of four sources of fallacy, we must be constantly on our guard ; the rub of the end of the sound on fasciculi of the bladder ; the grating of it on calculous matter entangled in the mucous lining ; the rub of a rough and enlarged prostate ; and the rub and grating of calculous matter in the prostatic or membranous portions of the urethra. If nothing is found in the ordinary site and in the ordinary way, posture is changed, and the search renewed ; in the erect posture, and then with the patient stooping much forward. The space above the pubes, in the latter position, is particularly explored. The stethoscope may possibly be of service, applied over the region of the bladder ; but it is difficult to repress the thought, that wherever a stone actually is, the signs emitted by the sound's use will be sufficiently distinct, without the aid of mediate auscultation. Change of posture having failed to detect stone, change in the state of the bladder may next be tried. The urine may be allowed to dribble away by the side of the sound ; and, as the bladder contracts, the sound is moved gently in various directions, so as to favour distinctness in the sensation of contact, should the stone descend upon it. Or a catheter, shaped like the sound, may be substituted ; and, during the rapid contraction of the bladder, contact may be ascertained. After failure by all the ordinary means, success has followed the use of an elastic catheter in this way :— With the bladder full, the patient, erect, makes water in a full stream through the instrument ; and, as the last drops escape, the stone falls on the point of the catheter and is felt.

Whenever difficulty is experienced in detecting a stone, in a case of plain symptoms, it is better to repeat gentle exploration at intervals, than by one continuous and prolonged perquisition to endanger the occurrence of cystitis, and sympathy of the kidney—perhaps peritonitis by extension, and death. In children, the prudent surgeon is not satisfied with any obscurity ; the click and rub must both be very distinct ; the

restlessness and crying of the patient being otherwise apt to lead to deception. It is chiefly in such cases, that blank lithotomy has been performed.

But, by the sound's use, we may ascertain some of the characters of the stone, as well as its existence. Moving the point over the stone's surface, we may be able to estimate the smoothness or roughness of it. Passing it over, and on all sides of the stone, we may obtain some idea of its form and bulk ; and, by the finger of the other hand in the rectum, we may sometimes be greatly assisted in this conclusion, by feeling its weight as it were, while at the same time its diameter, at least in one direction, is made apparent. It is right to remember, however, that, in the adult, stone may not be felt by the finger in the bowel. Moving the sound in the bladder, we may have a distinct sensation of one stone being left, while another is encountered by the instrument ; or plurality of stones may be indicated by another circumstance, the stroke of the instrument eliciting different sounds at different parts of the bladder—the sounds differing as to clearness, and as to pitch or tone. Also, a large stone is at once detected ; a small one may long elude the sound. And again, while the rub and and grating imparted by a large stone are most distinct, the click of a small stone is more clear and defined ; and the following practical inference may be almost arrived at—the smaller the stone the sharper and more distinct the sound ; the larger the stone the more palpable the feel. Further, when the symptoms have been of long duration, we may expect a large stone ; and *vice versa*. Also, phosphatic formations are apt to be larger than those of any other kind.

Having, by sounding, ascertained the existence of Vesical Calculus, the treatment of it naturally resolves itself into the following indications.

I. *Assist Nature's effort to expel the offending body.*—This, obviously, is applicable only to calculi of small size ; those, for example, which have recently descended from the kidney. Their natural progress is outward, with the current of urine. And in females this is usually effected readily ; the urethra being short, straight, capacious, and its current impetuous ; and hence one reason why vesical calculus in the female is rare. In males, however, there are many obstacles.

The urethra is both long and tortuous, it is comparatively narrow besides, and its current is proportionally defective in expulsive force ; spasm, too, is liable to interfere. And yet, judiciously assisting Nature, small stones may be thus got rid of ; by dilatation of the urethra, by diluents, and by forcible voidance of the urine. By the occasional introduction of bougies, the urethra is brought to more than the normal dimensions, while its irritability is also diminished ; and by the use of diluents, the flow of bland urine is considerably increased. It is well, also, to accustom the bladder to very considerable distention by its contents. Then, with the bladder full, and the urethra occupied by a full-sized bougie, the patient stands stooping ; and, the bougie having been suddenly withdrawn, evacuation is made in as full and forcible a stream as possible. In the case of enlarged prostate, the main obstacle to the escape of a small stone by the urethra is at the lower or posterior part of the outlet ; it is well, therefore, under such circumstances, that the patient expel his urine in a recumbent and prostrate posture.

The only objection to this mode of treatment, is the risk of arrest in the urethra, inducing retention of urine with its many dangers.

II. *Attempt Disintegration, medicinally.*—Attempts at expulsion having failed, or being deemed inadvisable, the following other modes of removal may be thought of ; solution within the bladder, forcible abduction by the urethra, disintegration by mechanical means, excision. The first of these indications may be attempted in two ways ; by medicines given by the mouth ; and by injections into the bladder. Of the former class of remedies, the alkalies are the most prominent ; especially the carbonates of soda and potass, given in small doses very copiously diluted—imitations of the natural waters of Vichy, of repute in calculous disorders. The oxalate of lime calculus resists their influence. But the uric formations are plainly to be benefited in two ways ; the alkalies tend to correct the diathesis whereby the calculus has arisen, and at the same time they have undoubtedly a sedative and corrective effect on the urinary organs—improving the secretion of the kidneys, and assuaging the irritability and disorder of the mucous coat of the bladder. They arrest growth, and palliate the symptoms of stone ; and experience

would seem to say, that a slow and uncertain diminution of the stone occurs during their sustained use. Further, the voice of experience certainly conveys the fact, that their continued use—provided it be in small doses, greatly diluted—has no injurious consequences either on the renal secretion or on the general health. In the case of phosphatic formations, large doses of alkalies must prove prejudicial; but doses, such as already mentioned, fail to do harm, and at the same time seem to have the effect of favouring gradual disintegration of the stone, by solution of the animal matter whereby the calculous particles cohere. Further experience in the use of these simple lithontriptics is much to be desired. But it is to be feared that the long continuance of use which is essential, and the uncertainty of the issue, will prevent any general employment of, or confidence in them. No doubt, however, they are of much value, in a subsidiary place; as means of delaying the increase of uric formations; favouring disintegration of phosphatic formations—as a prelude to Lithotripsy, for example; in all cases of stone, improving the state of the urine and of the lining membrane of the bladder, and so mitigating the distressing train of symptoms.

Solvent injections into the bladder have been in use since 1792; with various degrees of expectation. As yet, unfortunately, their success is far from great; and, as yet, we dare only place them in the same subsidiary rank as the internal lithontriptics. The agents employed have naturally been alkalies and acids; the one in uric formations, the other in phosphatic; introduced by means of a syringe operating on a double canula, whereby a constant stream may be kept in play on the calculus within the bladder. The objections are the same as before; delay in treatment, and uncertainty in effect. The acid injections, however, are not without their efficacy, as palliatives of the symptoms attendant on phosphatic calculus; employed weak, as correctives; not strong, as solvents. Of late, the carbonate of lithia has been supposed a promising solvent for the uric concretions. And the salts of lead have been proposed, as suitable for injection in the case of the phosphatic.

III. A method of *Snaring* has sometimes proved successful, in the case of small calculi. It having been observed

that, on removal of catheters used on account of retention, small calculi were occasionally found entangled in their eyelets, or lodged in the tube—it was thought that in cases of calculus, this, when small, might so be ensnared and withdrawn. M. Bourguenod was the first to adopt the practice; and he met with a few imitators. But success depends evidently too much on chance, and that chance is too remote, to admit of the procedure being favourably entertained by the practical surgeon.

IV. *Forcible Evulsion* may be attempted, by the urethra. By the forceps of Cooper, for example, a small stone may be seized and withdrawn. But all such proceedings have been justly superseded by Lithotripsy. The perquisition was painful and tedious; in seizing the stone, the lining membrane of the bladder was very liable to receive injury; and, after seizure, it was not improbable that the attempt at extraction might prove abortive—the stone perhaps becoming impacted in the urethra, and locked at the same time most inconveniently in the jaws of the instrument.

V. *The Calculus may be Disintegrated by Instruments.*—In fulfilment of this indication there are two methods; Lithotripsy, and Lithotripsy; the latter the more modern, and preferable.

Lithotripsy signifies a boring or rubbing of the calculus, in the hope of its becoming pulverized. This was first put in practice—at all events in modern times*—in 1800, by General Martin; who operated on himself, with partial success, by means of a file. In 1813, Gruithuisen proposed the use of a canula, through which, by means of a wire, the calculus was to be noosed, and then attacked by a borer. In 1819, Elderton invented a more feasible instrument. But neither of these were used in practice. In the same year, Dr. Arnott did good service, in illustrating the capabilities of the urethra and bladder, for the reception and play of suitable apparatus. In 1822, Amussat and Le Roy busied themselves in this department; the latter most ingeniously. And in 1823, M. Civiàle, availing himself of the labours of his predecessors, invented a three-branched boring appa-

* ALBUCASIS and SANCTORIUS had notions of bruising stones, and invented instruments for the purpose.

tus ; well adapted for drilling stones when caught—equally apt, however, to seize the coats of the bladder, and not very well adapted for disposing of the stone effectually. Its success in practice proved but indifferent. And, now, all such implements have been completely superseded by the crushing apparatus—more simple, safe, and effectual—whose use constitutes Lithotripsy.

Lithotripsy.

To remove calculus by crushing, was a more modern idea than that of boring or drilling. Various instruments have been proposed and used ; some with screws, some with hammers. At present, the voice of the profession is apparently unanimous in adopting the instrument constructed by Mr. Weiss ; an instrument originally invented in 1824, afterwards changed to the worse by Heurteloup, and subsequently restored and truly improved by the inventor ; composed of two blades, abruptly curved at the extremity—the one sliding on the other, and propelled by means of a screw.

A stone having resisted all endeavours towards its spontaneous expulsion by the urethra—and after, perhaps, a vain attempt has been made towards its disintegration by medicinal means—has but two ways of being efficiently dealt with—Lithotripsy, and Excision. Within these few years, a hot controversy has been waged between the supporters of these operations ; each party maintaining their procedure to be the preferable, and applicable to all cases of stone in the bladder ; one party attempting to grind or crush every stone that presented itself, the other using the knife indiscriminately. Fortunately, a better state of things now exists. The well-educated surgeon, finding himself equally well qualified to perform either operation, is in a position to consider, calmly and impartially, the bearings of each case that comes under his care. Some he finds suitable for Lithotripsy, others not ; and so some stones he attempts to crush, and others he at once sets aside for excision. And therein he does well. The one operation does not, and cannot, wholly supersede the other ; and yet there is every reason to hope that, in many cases, the crushing operation is by much to be preferred ; not less for-

midable in all cases ; but certainly less formidable in those whose circumstances we recognise as adapted to its use. The indiscriminate employment of the operation, however, has been fully established as somewhat more fatal than the indiscriminate performance of Lithotomy.

The cases favourable to Lithotripsy are of the following character :—The patient must be an adult, or almost so ; otherwise, the parts will not be found of capacity sufficient for the reception and play of the instruments, and the patient will not prove sufficiently steady in endurance. The urethra must be free from stricture ; the prostate must not be large ; the bladder must be not much diminished in capacity, comparatively free from irritability, and not sacculated ; the kidneys must be organically sound. Otherwise, the instruments will not have room for safe and efficient use, the risk of cystitis will be great, aggravation of renal disease will be certain ; and fragments, being received into sacculi, will be placed temporarily beyond the reach of treatment, and will enlarge into fresh calculi. The stone itself must be of no great size, and of no great density. The mulberry calculus is dense and firm enough to resist all the pressure which may be exerted safely ; stones of large size—say of uric formation—are obviously not amenable to the grasp of the instrument ; and, even if they were, the number of rough fragments, and the many seizures which would be required for their pulverization, would obviously tend to serious mischief in the bladder. Further, it were well that no great amount of viscid mucus were secreted from the bladder ; for this, entangling part of the debris, is likely to retain more than one nucleus for the reproduction of stone. Such are the cases favourable for Lithotripsy ; when the urethra and kidneys are organically sound, and the bladder and prostate are but little altered ; the stone small and soft ; the patient adult and steady ; the system not irritable. The limitation to adults, throws all children into the scale of Lithotomy ; and only those adults are saved from this operation, who apply early in the disease, and who have not previously suffered from serious derangement of the urinary function.

Even in the favourable cases, Lithotripsy is not without its risks and disadvantages. In the hands of the most ex-

pert, the stone is not always readily and at once caught ; perquisition may consequently be tedious and hurtful. The fragments must irritate the bladder more or less ; entailing at least some of the hazard which attends on spontaneous disruption. Fragments passing by the urethra create much irritation there, and may induce serious inflammatory action, extending to the bladder ; a fragment may be arrested in its outward passage, and cause perilous retention of urine. Small portions may remain behind, eluding the sound, and becoming sure nuclei for reproduction—loose in the bladder, entangled in adherent mucus, embraced by a fold of membrane, or embayed in a sacculated cavity. One operation is seldom sufficient ; repetition is necessary, perhaps once and again ; and, under this, it is not uncommon to find serious constitutional disorder arising, prominently connected with renal disease. It has been well remarked by Dr. Willis, that even the successful cases may present the following degenerate class of symptoms. Although the stone is gone, “ the man is not quite well ; irritability of bladder to a greater or less degree remains behind : this irritability increases ; the constant services of the medical attendant again become necessary. The patient is next tormented with ceaseless pain in the region of the bladder, which by and by extends up the loins, and settles in the back. The urine has never been healthy in its character, or it has altered at an early period of these untoward symptoms ; by and by it becomes like turbid whey ; it has a faint, sickly smell ; it coagulates on the addition of nitric acid and when exposed to heat ; the patient loses flesh and strength ; his stomach fails him ; he becomes sick and vomits ; he begins to dose ; and by and by he falls into a state of coma from which he never awakes ; or he is seized with convulsions in which he expires.”*

Such, then, we hold to be the true position of lithotripsy ; applicable to certain cases of stone ; for these much less hazardous than lithotomy, and therefore to be preferred ; always, however, liable to the objections of long time—comparatively—consumed in treatment, risk by repetition of the operation, and the danger of exciting or aggravating renal disease.

* WILLIS on *Stone*, p. 108.

When a favourable case presents itself, the operation is not at once to be had recourse to ; a certain period of preparation is essential. The general functions must be placed in a healthy state ; tongue clean, pulse natural, bowels open, skin acting well, &c. ; all phlogistic tendency must be overcome, by a certain amount of antiphlogistic regimen ; the urethra—if need be—must be dilated, and deprived of morbid irritability, by the occasional use of a bougie ; the bladder, too, must be accustomed to tolerable distension. A weak solution of the bicarbonate of potass or soda is given ; with the double view of amending the secretion of urine, and assuaging both renal and vesical irritability—especially the latter—at the same time favouring disintegration, by loosening cohesion of the calculous particles.

Circumstances being deemed favourable, the patient is placed recumbent, on a convenient table, bed, or couch ; with the pelvis elevated on a cushion—so as to throw the stone into the fundus of the bladder, away from the neck ; and with the bladder as full of urine as possible, in order to admit of seizure, retention, and crushing of the stone taking place within the cavity, at a safe distance from the coats. And if there be any doubt as to the quantity of urine retained for this purpose, let a sufficiency of tepid water be slowly injected by means of a syringe and catheter. Then the lithontriptor, having been introduced—with its curved portion of the fixed blade hollow, so as to prevent inconvenient impaction of fragments—is used first as a sound ; and the stone is usually struck where it is to be expected, at the then most dependent part of the viscus. On the mucous coat of the bladder at this point, the convexity of the instrument is made to press, while at the same time the thumb of the right hand moves the sliding blade backwards ; then a slight wriggling movement is made with the wrist ; and the stone, tumbling into the depression made by the downward pressure of the instrument, is felt between its jaws and secured. The direction of the lithontriptor—now holding the stone firmly—is then changed, so as to bring the stone into the supposed centre of the viscus ; away from the mucous coats, and with urine all around. Then the screw is applied, and the work of crushing proceeded with. But if there be any doubt as

to the instrument being free of the lining membrane, it must, in the first instance, be moved from side to side, or turned round, so as to make sure of this essential point. A small, friable stone may be pulverized at one seizure. Usually, fragments are made ; which in their turn require separate seizure and crushing. And for this latter work, a form of lithontriptor is preferable, whose fixed blade is not hollow at the curve ; there is now less chance of clogging such an instrument, and it is more efficient in dealing with small fragments, which might in a great measure elude the force of the weapon first used. Enough having been done—and to estimate this, we must consider not only the amount of crushing, but also the patient's tolerance of these seldom painless and bloodless proceedings—a full-sized catheter is introduced, shaped like the lithontriptor ; on opening its jaws, the urine with the finer of the detritus freely escapes ; and this extrusion—harmless and painless, because passing through the metallic instrument—is favoured by once and again injecting the bladder by tepid water, by means of a syringe fitted on to the catheter, but only provided the feelings of the patient admit of this. The patient is put to bed ; absolute rest is enjoined ; opiates are freely administered, by both mouth and rectum, if need be ; diluents are given ; and the antiphlogistic regimen is enjoined. Local loss of blood, and hip-baths may be required. During some days, fragments and sand continue to pass, with more or less suffering ; and, by and by, again the urine becomes clear and free. The bladder and system recover from their disorder ; a tolerance of the operation is again established ; and repetition may consequently be proceeded with, with all due caution. When, after one or more sittings, we have reason to suppose that the stone has been completely crushed and passed, careful perquisition is to be made with the ordinary sound ; and if this fail to detect any lurking fragment, the patient may be relieved from treatment ; much care being expedient for some considerable time, however, lest either renal or vesical disorder—especially the former—ensue.

Lithotomy.

This operation is preferable always in children ; in adults when the stone is large, and when it consists of the oxalate of lime ; when the bladder is intolerant of perquisition and distension. There are various modes of performance ; the lateral and bilateral ; the high operation, or supra-pubal ; the recto-vesical. For ordinary cases, the lateral is much to be preferred.

As early as the year 318 B.C., the ancients cut out stones, by incising the perineum freely, where the stone had previously been made prominent by fingers introduced within the rectum ; and this operation—the cutting on the gripe—continued in use till the sixteenth century. In 1525, Johannes de Romanis, of Cremona, incised the bulb on a sound, prolonging the wound into the membranous portion of the urethra ; the neck of the bladder he then dilated by male and female conductors, until the wound was deemed sufficiently wide for the introduction of forceps and removal of the stone. This operation—termed, from its complexity, the method by the “ apparatus major,” or the Marian method, from the name of an especially eloquent advocate of its superiority to all others—continued in vogue until 1697 ; productive, however, of only very indifferent success. In that year, Frère Jacques appeared ; the advocate of incision, as preferable to laceration ; at first cutting recklessly and ignorantly into the perineum, by an instrument very like a dagger ; afterwards operating with a common scalpel, and incising the prostate and neck of the bladder with scientific precision—having specially studied anatomy under Duverney at Versailles. This was the foundation of the lateral method ; afterwards practised with much success by Raw in Holland, and subsequently by Cheselden in this country—but not successfully by the latter surgeon, until he had recovered from mistakes into which he had been led, by the disreputably mysterious use which Raw had made of the knowledge which he obtained from the honest Friar. Of modern operators, Mr. Liston enjoys supremacy in reputation. His simple mode of operation is followed by the great mass of the profession ; and that method we shall proceed to describe.

From his high authority, in one point only would we venture to dissent. He is opposed to much preparation of the patient; conceiving that the delayed expectation of the event operates injuriously on the mind, and disposes to sinking, or at least to asthenic results. On the contrary, we think preparation quite as essential here as in the case of lithotripsy. We hold that it is necessary to subdue phlogistic tendency, to rectify general function, to quiet the bladder and system, and to amend the state of the urine—before the operation can be performed under auspicious circumstances; and that such preparation ought invariably to be made, whether the time occupied be of weeks or days. The use of the carbonates of soda or potash, in weak solution, not only may be expected to produce the good effects on the bladder formerly mentioned; but, besides, the urine, now by their use becomes less acrid than usual, will prove less hazardous in the event of infiltration in the wound.

The patient is placed on a firm table, of convenient height; and is bound securely, hand to foot, by stout tapes. It is well to clear the lower bowel, the evening before, by an enema, or by castor oil; and the bladder should be moderately full of urine. A staff is passed, of as large a size as the urethra will conveniently bear; grooved deeply on the convexity, a little to the left side. It will be more readily introduced before than after deligation; and the surgeon should be satisfied, before he proceeds a step further, that it impinges on a stone. If in doubt on this point, let him withdraw the staff, and introduce a sound. It is essential that the stone be felt immediately before the operation. Deligation over, and the staff satisfactorily passed, the patient's nates are brought to project a short distance over the end of the table; and there he is to be secured by assistants; one placed behind, with a hand on each shoulder, ready to oppose the involuntary movement of the patient from the operator; and one to each limb, holding them apart, and pressing each femur firmly down into the acetabulum, so as to fix the pelvis, and at the same time fully exposing the perineum. To the principal assistant, the staff is intrusted; to be held very steady, in a vertical position, and hooked up against the pubes—as much space as possible being thus made between the membranous portion

of the urethra and the rectum ; and the same assistant keeps the scrotum elevated. The surgeon, seated in front, at such a height as to bring his hand conveniently on a level with the perineum—and with all the instruments he is likely to require spread on a towel on the floor by his side, so as to be within easy reach when wanted—introduces his left forefinger into the rectum, to make sure of its being empty, and to stimulate it to contraction. The knife—longer than the common scalpel, especially in the handle, and with the posterior two-thirds of the edge blunt—is then entered in the perineum—previously well shaved—about an inch behind the scrotum, and at the same distance in front of the anus, on the left side ; and is carried downwards beyond the anus, passing about midway between that orifice and the tuberosity of the ischium, through the skin, fat, and superficial fascia. The fore-finger of the left hand is then placed in the wound, and directed upwards and onwards ; with the double object of keeping the bowel out of harm's way, and dilating the space—pushing aside cellular tissue, but not tearing muscular fibre. With the knife's edge, the fibres of the transverse muscle of the perineum—if it exist—are divided ; and such fibres of the levator of the anus as resist the free onward passage of the finger. The groove of the staff is now sought for ; and the finger is moved freely, so as to dilate the outward wound sufficiently—a touch of the knife's point being applied, warily, to any resisting part. Behind the triangular ligament, and in front of the prostate, the finger nail is lodged in the groove ; and over it the knife's point is made to perforate. The knife, felt distinctly on the staff, is then pushed onwards in the groove, obliquely downwards and forwards ; so as to divide the portion of the urethra which intervenes between the point of the knife's entrance and the prostate gland, and also the anterior part of the prostatic portion of the urethra. In other words, space enough is made for introduction of the finger—which follows the knife ; and the base of the prostate gland is left intact. The finger, introduced and moved freely, increases the space very considerably ; the substance of the prostate being very capable of dilatation. And this dilatation of the wound is very preferable to incision ; there being much risk in wounding the reflexion of the ileo-vesical fascia

which is situate at the base of the prostate, and which serves as an important boundary between the deep and superficial cellular tissue. By leaving this entire, the principal danger by urinary infiltration is shunned. And by dilatation of such a limited wound as now described, ample space is afforded for the introduction and play of forceps, and for the extraction of ordinary calculi. Large stones require particular expedients, to be afterwards explained. In fact, the rule in this lateral operation is, to have a free external wound, and a small internal one; the latter, when dilated, extending from the point of puncture in the membranous portion of the urethra, to near the base of the prostate; the former varying in extent according to circumstances—always large and free, and largest when either a deep perineum or a bulky stone is expected to be encountered; for, the yielding of the surface both gives room and diminishes depth, in the work of extraction, and in the formation of the deep wound. In withdrawing the knife, some little care is necessary, lest the edge should inadvertently come too near the ramus of the ischium, and endanger the pudic.

The making of the deep wound requires deliberation and care; and it is expedient that the points of the finger and of the knife should move together, in order to secure exactness. In athletic adults, naturally of a deep perineum, difficulty may be experienced at this stage, by straining of the muscles, whereby the bladder is elevated in the pelvis, and the parts consequently removed from the control of the finger. Under such circumstances, it were rash to proceed with the knife alone. The operator must withdraw the knife; and, keeping his finger in the deep wound, he should wait patiently until the straining or spasm has ceased; reasoning with the patient on the propriety of his being as passive as possible; and resuming the operation, when the parts to be incised are again found to be within his finger's reach.

While the fore-finger dilates the deep wound, the urine escapes more or less rapidly; and we expect that the stone, descending in consequence, will be distinctly felt. Then the staff is gently withdrawn; by means of the finger moving in contact, a more precise idea of the nature of the stone or stones is obtained; as to size, number, shape, and position;

and to the circumstances thus ascertained, the subsequent proceedings are adapted. If, for example, the stone be found of larger size than what the surgeon knows will pass readily through the aperture he has already made, an addition of space may be gained, without tearing, and without the division of any parts which it is expedient to retain entire—by passing a straight probe-pointed bistoury over the fore-finger retained in the wound, dividing the prostatic region of the urethra on the right side, to the same extent as on the left, and then renewing dilatation. When the stone is expected to be of considerable size, the surgeon is prepared to adopt this bilateral incision from the first.

The wound being deemed sufficient, and the finger being in contact with a stone of ordinary character, forceps are to be introduced, for seizure and extraction. These should be, in length of handle, and capacity of blades, proportioned to the size of the stone ; the object being, that the blades shall embrace the calculus at as many points as possible, and that the handles shall be long enough to give a full lever power in extraction. The blades are partly lined with calico, so as to diminish the chance of the stone slipping from their grasp. An instrument, suited to the stone, having been selected, is passed over the finger to the deep wound ; and, as the finger recedes from this, the forceps enter, and come in contact with the stone. If this is not at once felt, the handles should be elevated, so as to depress the blades to the part of the bladder where the stone is most likely to be. The blades are opened, and, by a catching movement of the instrument, seizure is effected. If any suspicion exist that a portion of the bladder may have been included along with the stone, the instrument is turned round so as to test this ; freedom of movement implying freedom of the bladder. Seizure having been accomplished, the axis of the forceps is changed ; the point is raised, and the handles are depressed. The fore-finger is then reintroduced by the side of the instrument, and between the blades, to ascertain in what direction the stone is placed, and to rectify the position if necessary. For example, if an oval uric calculus have been seized in the transverse direction, it will not pass through the deep wound, without much violence, if at all. The jaws of the instrument are slightly relaxed ; and

with the fore-finger's point the stone is gradually and carefully shifted, until the long diameter presents to the wound. Then the extracting force is applied ; pressing the handles to each other as much as is necessary to prevent slipping of the stone, and not so much as to endanger its being broken ; directing the handles, and consequently the extracting force, according to the axis of the pelvis—obliquely downwards—not jamming the blades beneath the arch of the pubes ; and moving the forceps antero-posteriorly, so as to gain room by further dilatation. By pressure of the finger, the bladder is prevented from descending along with the stone ; or, in other words, counter-extension is made to the extension of the forceps, fixing the bladder, and allowing extraction to be made more effectually than it otherwise would be. After having passed the prostatic wound, resistance may be offered by fibres of the levator of the anus—insufficiently divided by the incisions ; this obstacle may be overcome by the finger also ; or it may be necessary to notch the resisting fibres by the edge of a probe-pointed bistoury.

In the case of a number of small stones, the metallic scoop will be found generally preferable to the forceps. The instrument is first used as a sound, passed through the wound ; the stone, having been found, is moved towards the opening in the bladder ; and then—if not before—being brought in contact with the point of the fore-finger, is withdrawn—steadied on the scoop by the finger's pressure.

Sometimes the stone is lodged above the pubes, and refuses to descend. In such a case, curved forceps are of use ; but the difficulty is of rare occurrence. The stone may be encysted ; a part only projecting into the bladder. The forceps seizing the projection may bring the whole away ; if not, it may be necessary—when the part is within reach of the finger's point—to dilate the cyst's orifice slightly, by a probe-pointed bistoury. If the stone be firmly impacted, and not to be loosened safely by the bistoury's edge, the operator must have recourse to expectancy. The wound is occupied by a full-sized tube ; and, during the suppurative stage that follows, it is hoped that the textures may relax, and the stone be disengaged. Then it may be removed in the ordinary way—as has been experienced. Fortunately, however, such a complication is

of rare occurrence. Bent forceps may also be useful, when, in an old man, the stone is lodged in a deep pouch of the bladder, behind a prostate very much enlarged.

Should the stone break and crumble under the forceps, the scoop will be found well adapted for removing the fragments. And in such cases, to make sure that nothing is left behind, it is well to wash out the bladder. This may be done in two ways ; by means of an ordinary enema-syringe, the tube being introduced by the wound ; or, by means of a syringe and catheter, the latter introduced by the urethra, a powerful stream may be made to issue by the wound—the patient being placed in a sitting posture.

The stone, or stones—readily felt, by the finger, forceps, or scoop—having been removed, the Searcher is introduced—a metallic sound, with a large bulbous extremity ; and by this each part of the bladder is carefully explored, in order to make sure that no stone or other foreign body remains behind. It is also useful to examine the stones themselves ; if one be removed, and found smooth, or hollowed, at one or more points, we may be tolerably certain that there is at least another in the bladder ; if, on the contrary, a stone is found rough and unrubbed at all aspects, we may conclude that it is solitary. Then a tube is introduced, and retained by tapes fastened to a bandage round the belly ; the tube being of length sufficient to admit of one extremity projecting from the outer wound, while the other is lodged in the bladder ; and of diameter sufficient to admit of free escape of both blood and urine. The nates having been sponged and wiped, the patient is unbound, and lifted into bed ; and there placed with the shoulders elevated, so as to favour the outward passage of urine, by sloping the track of the wound ; with the knees elevated, and placed slightly apart—supported in the ham, if need be, by a pillow ; and with an oil-cloth and sponge comfortably arranged for the reception of urine and protection of the bed-clothes. If much pain continue, an anodyne is given ; and henbane is preferable to opium, being less likely to interfere unfavourably with the secretion of urine. The regimen is antiphlogistic for some days ; and plenty of diluents are given, so as to favour copious secretion of urine ; barley water, for example, is given *ad libitum*,

or rather may be pressed upon the patient ; and it may not be amiss to medicate it slightly with the alkaline carbonate, so as to ensure the urine being bland as well as plentiful. Copious "wetting" is always a favourable sign ; denoting a healthy condition of the kidneys, absence of febrile disturbance, and but slight risk of dangerous infiltration.

The tube is retained, until there is reason to believe that the margins of the wound have become "water proof," by consolidation and glazing consequent on plastic exudation ; the object of this instrument being two-fold—the prevention both of urinary infiltration, and of accumulation of blood within the bladder. It is also useful, in the event of hæmorrhage from the deep wound, as will be stated immediately. During the first few hours, an assistant must frequently introduce a quill, or other suitable instrument, for the purpose of preventing occlusion of the tube by coagulated blood ; but when the urine is coming clear, this precaution may be dispensed with. No dressing of the wound is necessary until the tube is out ; and then simple water-dressing, afterwards medicated, as circumstances indicate, is all that is required. When we wish to remove the tube, it is sufficient to cut the retaining tapes ; and this may be done after twenty-four hours in the young, but not till nearly twice that time has elapsed in the aged—the plastic process being much more energetic in the one case than in the other.

After withdrawal of the tube, the wound contracts by the ordinary process of healing. And, after about eight days—sometimes sooner, sometimes later—uneasy sensations are begun to be complained of in the urethra, betokening a restoration of its function as to the passage of urine. The first flow by the natural channel is partial, and accompanied with great pain ; day by day, less and less comes by the wound, and the uneasy sensations in the urethra disappear. Ultimately, the wound heals, and all is normally re-established. If any unusual delay occur, it may be necessary to pass a catheter gently ; to ascertain the state of the urethra, and clear away obstruction if necessary ; at the same time inviting the flow to its pristine course.

During the after part of the treatment, diet is gradually amended, as circumstances indicate ; the erect posture is re-

sumed, and the patient may be permitted to move about a little, even before the external wound has quite contracted. Such medical treatment, by hygiene, will be continued, as is suited to prevent recurrence of the diathesis on which the stone's formation depended. But experience proves that no great care in this department may be required; the operation, in many cases, seeming to have the effect—not easily explained—of changing the system wholly in this respect. Reproduction of stone, after well-performed lithotomy, is decidedly rare; yet it is well in all cases, by maintenance of due prophylaxis, to leave no means untried of preventing so unpleasant a relapse.

Such is the usual result of an ordinary and successful case of lithotomy. But there are risks and casualties which now fall to be considered.

I. *Hæmorrhage*.—If there be a transverse artery of the perineum, of any considerable size, it may be troublesome by its bleeding; it cannot be avoided in the incisions; but it can very readily be secured by ligature. By attending to the following circumstances, wound of the artery of the bulb will be avoided, when that vessel follows its ordinary course; making the free external incision of no greater depth than the superficial fascia; cutting afterwards on a low level—sloping the main wound obliquely upwards, from the level of the anus to the membranous portion of the urethra; never using the knife but with its back directed upwards; using the finger, to dilate, more freely than the knife to cut, in making the deep wound of the perineum; taking care to enter the knife's point, in the groove of the staff, behind the bulb; and, at this part of the operation, invariably moving the knife from the operator, with its back towards him. If the artery follow an unusual course, it may be detected and avoided; when the operator adopts the safe and good practice, of invariably preceding and accompanying his knife's point with his finger. When the vessel is wounded, three courses are open; to attempt deligation at the cut point—difficult, but not impracticable; to pass an aneurism needle round the trunk of the pudic, on the inside of the ramus of the ischium, securing it by ligature there—also difficult yet possible; or simply to apply pressure to the vessel in the latter situation, by

an assistant's finger placed either in the wound or in the rectum—maintaining such pressure by a relay of assistance, until the bleeding has ceased. Veins or small arteries may bleed to excess, in the neighbourhood of the prostate—especially in the aged. This form of bleeding is readily restrained by pressure; pledgets of lint being introduced firmly into the deep wound, along the tube—and retained, if need be, by a T bandage. This is one of the important uses of the tube; its presence, as an open conduit for the urine, admitting of such plugging being made, with perfect safety as to the chance of urinary obstruction and infiltration. Arnott's fluid dilator is well calculated to be a successful compressing agent in such bleeding; the open tube occupying the centre of the apparatus, and the compressing fluid consisting of cold water; by cold and pressure the apparatus is doubly hæmostatic. Secondary hæmorrhage sometimes occurs in the aged, in consequence of the accession of asthenic ulceration in the deep wound; this requires the ordinary hæmostatic treatment by general means.

II. *Peritonitis*.—This is not so common as was once supposed; the symptoms of urinary infiltration being apt to be mistaken for those of peritonitis. It is the result of inflammation in the deep wound, extending thence to the general coats of the bladder, and from the outer coat passing to the general peritoneum. Or it may be occasioned by violence directly done to the bladder, by the forceps or scoop. It is accompanied by its ordinary signs and symptoms; and is amenable to the ordinary treatment—leeching or venesection, calomel and opium, &c. It is obviated, by taking care, in dilating the deep wound, not to tear; by not bruising or tearing the vesical coats in any part, through inadvertent seizure by the forceps or scoop; and by never operating while the bladder is in an irritable or excited condition.

III. *Urinary Infiltration* is the most serious risk in Lithotomy; and the one of most frequent occurrence. To obviate it, the following points are of essential importance. Maintain the reflexion of the ileo-vesical fascia entire, at the base of the prostate; that gland being not divided throughout its whole extent, by the knife—but rather first notched, and then dilated by the finger and forceps. Make the general

wound conical in form ; the base at the integument of the perineum ; the truncated apex at the prostate. Make the general wound also sloping in form, its fall being from the prostate obliquely downwards—cutting obliquely up to the bladder, not directly into it ; also, arranging the patient's trunk in bed, so as to favour this sloping form, obviously so well calculated for the ready draining away of the urine. In using the finger in dilatation, avoid all laceration ; torn parts being but ill-disposed for rapid plastic exudation. Retain the tube for the necessary number of hours ; and keep it clear from coagulum, or other source of obstruction. I have latterly thought it advisable to use a somewhat larger tube than that in general use ; in the belief that it is better adapted for preventing urinary infiltration ; as, while it affords a more ready exit to that fluid, it compresses the track of the deep wound, and may be supposed to afford a very effectual barrier to entrance of urine into the cellular tissue. Further experience of its use, however, is necessary ; to determine whether or not it may do harm, by delaying the closure of the wound, and exciting inflammation at the neck of the bladder. Further, the risk by infiltration is certainly diminished, by not operating unless the urinary organs and general system are free from excitement, the kidney acting healthily, and the urine in a satisfactory condition ; and also by maintaining, after the operation, a supply of urine which is bland as well as copious—mainly aqueous, and containing but a sparing amount of saline matter. For, if infiltration do occur to some extent, it will be less hazardous to part and system under such circumstances, than if the infiltrated fluid were the acrid and scanty urine of fever or of renal disease.

Urinary infiltration is indicated by the following symptoms :—A hot pain is felt in the site of the deep wound, thence creeping up the left hypogastric region, which by and by becomes very tender on pressure ; the pulse becomes rapid and weak—denoting constitutional irritation, not inflammatory fever ; the skin is hot and dry ; the tongue and lips are parched and dark-coloured ; the wound is dry and glazed in its edges, afterwards emitting a foetid sanies ; and the secretion of urine is in a great measure arrested. Ultimately, hiccup comes on, the abdomen grows tympanitic,

and the patient is carried off in typhoid prostration. The local changes are—sloughing of the infiltrated cellular tissue, under an asthenic inflammatory process; with thin, foetid discharge. The treatment is by the ordinary means, adapted to bear the system through the irritation dependent on such a cause. And if the wound do not seem free and sloping enough, that defect may be remedied by an enlargement of the external wound at its lower part. On the first rising of the asthenic action, we may be for some time uncertain whether the case is one of this nature, or peritonitis; and then a sparing application of leeches over the tender hypogastrium is expedient. After infiltration is declared, however, further spoliation or depression is quite unwarrantable. By some it has been thought advisable to enlarge the wound, and to divide the rectum at the same time, by the sweep of a curved bistoury; on the principle of freely incising the infiltrated parts, and permitting the noxious fluids a ready outlet.

IV. *Urinary Infiltration and Peritonitis may occur together*; an unhappy combination—known by a blending of the signs and symptoms of each. In treatment, it is perplexing to determine whether the one disease shall be more considered than the other. But it is, perhaps, a safe general rule, to award pre-eminence to infiltration; treating it much in the ordinary way; in other words, endeavouring to support the system at all hazards, and hoping to afford it an opportunity of struggling through the inflammatory action.

V. *The Wound may Inflamm*; suppurating copiously; perhaps sloughing. This is dangerous to a weak frame, by reason of the grave amount of constitutional disorder which attends, more especially when the deep part of the wound is much affected; the patient may sink under inflammatory fever; or he may afterwards succumb to hectic. The inflammation is obviated, by care in the use of the finger and forceps—neither tearing nor bruising; and it is treated by the ordinary antiphlogistic means—cautiously, with a view to the coming chance of a hectic tendency under a long open and discharging wound. For, the sloughs must separate; enlarging the wound, and necessarily delaying greatly the process of cure.

VI. *Cystitis* is to be obviated, by operating only in a quiet state of the bladder; by avoiding bruise of the prostatic wound; and by using the forceps and scoop with all gentleness, in reference to the coats of the viscus.

VII. *Aggravation of Renal disease*.—Plain indication of organic disease in the kidney, is held sufficient to contraindicate the operation. But the symptoms of this, obscure and masked, may have deceived the surgeon. In such circumstances, the aggravation following on the operation will be subdued with difficulty; the patient will in all likelihood perish.

VIII. *Constitutional Irritation* may prove dangerous in one of two forms:—1. As a *Shock*; the immediate consequence of the operation. This may occur to a grave extent, as after other severe operations; and the patient may never rally—death taking place within twenty-four hours, by sinking. Or *Hectic* may ensue; in consequence of the wound remaining long open, and emitting a copious discharge; as is apt to occur after inflammation of its track in a weakly patient. Then we have to invite restoration of the urethral flow, by the cautious use of a catheter; to favour closure of the wound, and diminution of the discharge, by suitably stimulant dressing; and to maintain the powers of the system, by the general treatment adapted for hectic. Sometimes, this state of matters has been found dependent on the presence of another stone within the bladder, preventing closure of the internal wound; overlooked in the operation; or, perhaps, since descended from the kidney. Under such circumstances, it is our duty to dilate the wound, and to obtain extrusion of the stone by the scoop or forceps.

IX. *Erysipelas* may occur; extending from the wound to the nates and thighs, as well as to the perineum and the abdominal parietes. It is obviated, by never operating unless the primæ viæ are in a satisfactory condition, and by great attention to cleanliness; maintaining a proper staff of attendants, who keep the patient dry, clean, and as comfortable as circumstances will allow.

X. *The Wound may become Fistulous*.—It may contract to a certain extent, and then remain stationary; a portion of the urine continuing to pass through the fistulous track. This remote result is more troublesome than dangerous. The ure-

thra will most probably be found at fault—obstructed in some part of its course by former stricture, or by recent swelling; and the catheter or bougie has to be used accordingly. After due clearance of this canal, the perineal fistula will probably close. If not, it is to be treated as obstinate fistulæ usually are; by application of a hot wire, at long intervals.

Rectal Fistula sometimes results, by wound of the bowel at the time of the operation; or, it may be caused more remotely by ulceration. The aperture may close, with the rest of the wound. But not improbably it remains open; fæces finding their way upwards into the track of the general wound, and urine passing into the rectum. Such a casualty is obviated by care, during the operation, in interposing the left forefinger between the knife and the bowel, and always using the former most cautiously. The treatment consists in dividing the coats of the bowel up to the aperture, as in fistula in ano; but this is not done at once; an opportunity is first afforded for spontaneous closure.

Such are the more important and ordinary dangers and difficulties which attend this operation. We are constantly liable to meet with others, however, which can scarcely be brought under any categorical arrangement; and yet for them the surgeon must be at all times prepared. I had occasion recently to operate in a case thus complicated; the outlet of the pelvis was narrow; the perineum was deep; a cyst existed on the lateral exterior of the prostate; at least two round and distinct medullary tumours projected from the neck of the bladder into its interior; the stone proved large, weighing six ounces and a drachm, and measuring nine inches and a quarter in its largest circumference. The patient sank on the fifth day, under symptoms of infiltration. The deep wound was more free and uncertain than I could have wished; and the operation was necessarily tedious.

The operation of lithotomy, in itself difficult, beset with many dangers, and implicating important parts, cannot be expected to prove very highly successful, even in the most skilful hands. The average proportion of deaths, hitherto—in the general practice of surgery—may perhaps be stated at one in five or six. But as our science and art advance, it is to be hoped that the average result will rise proportionally.

Some individual operators have attained to very pre-eminent success in this department ; a pre-eminence apparently due, partly to operative dexterity and skill, partly to careful and judicious treatment both before and after the operation, partly to a wise selection of cases. The age of the patient has much to do with the prognosis. In childhood, recovery is the rule, death the exception. And the old man is more favourably situated than the robust and young adult.

Varieties in Lithotomy.

In young children, the operation may be done with a common scalpel. And it is essential to remember that in them the bladder rises comparatively high in the pelvis. The rectum is then the predominant viscus of the pelvis ; and great care must be taken accordingly, not to injure it by the knife. The patient may be exempted from deligation ; held firmly on an assistant's knee.

The Bilateral Operation.—When the stone is known or suspected to be of large size—too large to pass through the ordinary single wound of the prostate, but not too large to pass through the outlet of the pelvis easily—the wound is made *bilateral*, as has already been explained, (p. 455.) But such bilateral section seems quite unnecessary in ordinary cases.

If, unfortunately, the surgeon have been deceived as to the bulk of the stone ; and, after having made his bilateral section with perineal wound, finds that the stone is too bulky to pass, even were it extra-vesical—he must either proceed to the high operation, or attempt to break the stone, and extract it piecemeal, through the perineum. The *crushing* instruments, necessary in such circumstances, need not be described. They are to be found in cutlers' shops, and in the armamentaria of most lithotomists ; but, fortunately, are seldom if ever called into exercise. The simplest form of instrument is probably the best ; strong forceps, the blades armed with teeth, and the handles approximated by a powerful screw.

The operation *a deux temps*—cutting into the bladder one day, and attempting to extract the stone on another, during suppurative relaxation—is wisely abandoned ; unless in the case

of obstinately encysted stone, already alluded to. In no other circumstances is such a plan of operation voluntarily adopted; but it may be thrust upon an operator by the stern force of circumstances.

The *Gorget*, too, is but little used in the present day. For the blunt gorget, the operator's fore-finger of the left hand is a very superior substitute, as a guide and conductor of forceps into the bladder. And the cutting gorget, however modified, can never be so certain or so safe, as a knife's point guided and controlled as we have endeavoured to describe. In the hands of the careless or inexperienced, the cutting gorget may be the cause of frightful accident. Pushed recklessly on, it is as likely to be out of the bladder as in it. It may pass—has passed—between the bladder and os pubis, pushing up, bruising, detaching, or tearing the peritoneum; or between the bladder and rectum—as has more frequently been the case; in either way, favouring the most hazardous infiltration, and perhaps combining this with peritonitis. It has happened, indeed, that by a more heroic thrust, the bladder has been completely perforated, the intestines have protruded, and the lobulus Spigelii in the liver has been found wounded!

The *Recto-vesical* operation is also out of date. It was supposed that, by cutting through the rectum, and thence reaching the posterior part of the bladder uncovered by peritoneum, less hazard would be incurred, by peritonitis, hæmorrhage, or infiltration. But the misery and even danger of a foul fæcal fistula remaining, was found by much to counterbalance the supposed safety of the procedure. Under certain circumstances, however, such an operation may be thrust upon us; as in the case narrated by Mr. Liston, where a large stone was found encysted in the posterior part of the bladder, and bulging into the rectum. In that case, after the ordinary opening had been made into the bladder, it was found impossible to dislodge the stone without division of the anterior wall of the cyst; and that could not be accomplished, without incising the corresponding portion of bowel. Then the stone was readily extruded.

The High Operation.—When a stone is deemed too large to pass with safety through the outlet of the pelvis, by the

perineum, it is to be sought for above the pubes. By a blunt staff, introduced along the urethra, the fundus of the bladder is elevated as much as possible in the pelvis, so as to enlarge the space uncovered by peritoneum on the lower and anterior aspect. A suitable wound is made through the abdominal parietes; entering the knife immediately above the symphysis pubis, and carrying it upwards as far as seems necessary; cutting layer after layer, cautiously, until the vesical coats are reached. At the lowest part of the wound, these are punctured; and, the finger having been introduced into the bladder, the aperture is enlarged to the requisite extent. The stone is seized by forceps, and removed. The wound is brought together, having a short tube—or a slip of lint, syphon-like—at the lower part, by which the urine may pass readily away, and infiltration be avoided. To aid in this indication, the patient is laid on his side; and perhaps a flexible catheter may also be passed by the urethra, and retained. But with every care, it is difficult to prevent this grave accident—so likely to occur, from the non-dependent nature of the wound. And, consequently, the results of this operation are not found to be very encouraging.

Recently, an important modification has been suggested; the premising of a perineal puncture; a track of wound resembling that of lateral lithotomy, but on a smaller scale; the internal opening implicating the membranous portion of the urethra only. Through this puncture, the elevating blunt staff is introduced, and may be worked more efficiently than from the urethra. After removal of the stone, a common lithotomy tube occupies the place of the staff in the perineal wound, and is retained for some days, the urine passing readily through it—the patient's trunk being slightly raised to assist in this. The supra-pubal wound is brought accurately together throughout its whole extent, and union by the first intention hoped for. And thus the operation may be not only simplified in performance, but also the great danger by infiltration may be effectually avoided.

Lithectomy.—Another recent proposal, is the substitution of lithectomy for lithotomy; that is, wound of the membranous portion of the urethra, and gradual dilatation of this—for wound of both this and the prostatic portion, dilatation and

extraction following immediately. The operation is simple, and probably safe. Lithotomy is performed on a small scale ; or, a puncture is made in the central space of the perineum, above the anus. The membranous portion of the urethra is reached and opened. No attempt is then made to reach the bladder and stone by the finger, but the wound is occupied by sponge-tent, or by Arnott's fluid dilator ; and thereby dilatation is effected more or less rapidly. In the course of twenty-four hours, the space may be expected to be suitable for the introduction of instruments, and for removal of an ordinarily-sized stone—the neck of the bladder being left undivided, and the great hazard by infiltration being almost certainly avoided.* But the manifest objection to this proceeding is, its slowness and uncertainty. Under tedious and painful dilatation, the patient is very liable to suffer serious irritation, both mental and bodily ; and a susceptible frame may be irreparably injured thereby. Also, after the allotted period of painful probation has passed, the space may be found insufficient ; the dilator has to be resumed, or the knife is employed ; and, in any way, danger is incurred. Further experience is yet required, ere the merits of this operation can be finally determined. But at present one naturally inclines to think, that it can be applicable only to small stones ; and that these may be better dealt with by lithotripsy.

Palliation of Vesical Calculus.

We are called upon to palliate the symptoms of stone, irrespective of any operation, when the patient refuses to submit to this, or when the circumstances of the case obviously contra-indicate its performance. If the patient is very far advanced in years, and suffers comparatively little from the stone, we decline to operate. When the patient is aged, and afflicted with great enlargement of the prostate—perhaps malignant—we cannot expect a successful issue ; and the operation can scarcely be looked upon as a likely means towards Euthanasia. When the kidneys evince organic disease, by

* WILLIS on *Stone*, p. 160.

coagulability of the urine, renal pain, constitutional disorder, purulent urine, &c., we cannot expect but that the operation will produce renal aggravation and prove fatal. In these cases, therefore, and such like, we content ourselves with palliating what we cannot cure. All violence and imprudence in exercise and regimen are avoided; the bowels are gently regulated; by alkaline or acid remedies internally, the condition of the urine and of the bladder is hoped to be amended; and by opiates, by the mouth or anus, pain is assuaged. When the phosphatic diathesis is not strongly marked, nothing proves more efficacious than weak doses of the alkaline carbonates much diluted.

Urethral Calculus.

Calculus in the urethra is sometimes original; foreign matter having been in some way introduced from without, and calculous deposit concreting on this as a nucleus. Much more frequently, however, it is secondary; a vesical calculus having been arrested in its progress outwards. It either is simply impacted in the canal, which dilates behind it; or it becomes imbedded in a cyst or cavity—sometimes formed of the urethral parietes, sometimes of condensed cellular tissue exterior to these. In the latter case, the symptoms may be slight; there being little obstruction to the flow of urine. Impaction in the canal, on the other hand, causes much distress, by pain, frequent desire to make water, and imperfect ability to obey the call. If obstruction is complete, serious danger by retention of urine ensues. The calculus, when situated anteriorly, may be felt by manipulation in the course of the urethra.

Treatment varies according to circumstances. 1. If the stone be of considerable bulk, and arrested at the posterior part of the canal—and more especially if retention of urine exist—a catheter is to be introduced, by which the stone is dislodged, and pushed back into the bladder. There it can be afterwards dealt with by Lithotripsy. 2. If the stone be small, and situated anteriorly, it is to be brought to the orifice of the urethra, and thence extruded. Such forward movement may be effected by the fingers simply. Or a loop

of wire may be insinuated past and behind the stone ; and thus it may be extracted, like a cork out of a bottle. Or it may be seized by small dressing forceps ; or—more readily—by Hunter's forceps. Or a bent probe may be passed behind, and by it extrusion may be effected, as in the case of foreign bodies lodged in the nose or ear. 3. But the stone may be fixed, and not inclined to move in any direction. Then it is to be cut out. If situated in the prostatic or membranous portions, the operation of lithotomy on the gripe may be had recourse to. The fingers of the left hand, passed into the rectum, push the stone forwards on the perineum ; and there, through a semilunar incision made across the raphé, above the anus, it may be extracted. Or, lateral lithotomy may be performed on a small scale. And in having recourse to this latter operation, for a stone of some size, lodged in the prostatic portion of the urethra, and long resident there, it is well to remember that considerable alteration may have taken place in the bladder. It may have contracted completely on the stone ; the ends of the ureters abutting on it, and there being no cavity beyond ; the urine coming away constantly, by stillicidium. If a stone be found already in the perineal portion of the urethra, it is to be removed through a direct incision, made in the centre of the raphé. If one present itself anterior to the scrotum, it is well not to excise it there ; for, wounds in that situation are slow to heal, and apt to degenerate into troublesome fistulæ. By manipulation let it be brought behind the scrotum—if it refuse to advance to the orifice—and there let it be excised, through a deeper but more manageable wound. Not unfrequently a calculus, after having passed all the rest of the urethra, with more or less suffering to the patient, is arrested at the orifice. Thence forceps, or a bent probe, may remove it. But if such difficulty be found in the attempt, as to threaten laceration of the parts by continuance, let an incision be made to dilate the orifice, by means of a narrow probe-pointed bistoury ; and then extrusion will be simple and immediate. 4. Sometimes a calculus, lodged in the urethra, works its way out by ulceration and abscess ; presenting itself in the perineum or scrotum ;—a tedious and unsatisfactory process, not to be wished for, or trusted to in treatment.

Præputial Calculus.—When the prepuce is congenitally long, and of tight orifice, and when the patient labours under calculous diathesis, a concretion may form exteriorly to the urethra, within the cavity of the prepuce; the urine being in some proportion retained there, after micturition, and having opportunity thus afforded for deposit. The symptoms are most manifest; painful and frequent micturition; congestion of the parts; the stone to be felt by manipulation, and also on introduction of a probe through the narrow præputial orifice. The treatment is simple. By a curved bistoury the prepuce is divided on its lower aspect; and by this simple incision two evils are at once remedied: the stone is dislodged, and the condition of phymosis is removed.

Prostatic Calculus.

The term *Prostatic* is not applied to a vesical calculus, which, in its passage outwards, has been arrested in the prostatic portion of the urethra; but is properly limited to those concretions which form in the ducts of the prostate gland. They are of small size, brown, smooth, and sometimes numerous; and consist of phosphate of lime, sometimes mixed with carbonate of lime, deposited from the secretion of the ducts. They produce more or less irritation at the neck of the bladder; especially after the bladder has been emptied. When they project into the canal, a sensation of rubbing may be felt when a sound passes over them. And, if in numbers, they may be felt sliding on each other, by a finger introduced into the rectum, and pressing upon the part. Whatever tends to vitiate and retain the secretion of the ducts, tends to the formation of such concretions. Hence they are generally met with, in cases of tight stricture of the posterior part of the urethra. The ordinary result is one of two events. The calculus, reaching the orifice of the duct, drops back into the bladder, and may be either extruded thence, or remaining may constitute the nucleus of a vesical concretion. Or the stone or stones remain in the substance of the gland; perhaps leading to abscess and disorganization.

In the case of small projecting calculi, they may be dislodged by the end of a catheter; to be afterwards passed by

the urethra, or to be ground by lithotripsy. And in the great majority of cases, they may be passed readily enough, if no obstruction exist in the urethra. In the case of numerous calculi lodging in the gland, a small lithotomy may be had recourse to—an operation, however, which is very seldom required.

Calculus in the Female.

As already stated, urinary concretions are comparatively rare in the female; for two reasons; because the calculous diathesis is less common; and because, the urethra being short, capacious, straight, and well flooded, extrusion of renal formations is more probable than retention. Nuclei are not unfrequently afforded, however, by the introduction of foreign matter from without; and these substances may be of bulk and form not favourable to extrusion under any circumstances; bodkins, pencils, glass stoppers, coal, sandstone, &c.

When a stone does form, and remains, the symptoms it occasions are quite analogous to those in the male. Perquisition is made by a short, straight, steel staff, slightly curved at the extremity. And a stone, having been found, may generally be got rid of without incision. The urethra admits of great dilatation; and if this be done gradually, but little pain is caused. Sponge-tent, Weiss's metallic dilator, or Arnott's fluid dilator, may be employed. And a sufficiency of space having been so obtained, forceps or a scoop are introduced, and the stone removed. The risk is, that, in consequence of the dilatation, power of retention may be seriously impaired, and more or less inconvenience by incontinence of urine may result.

If the stone be found of larger size than to pass by dilatation alone, the knife is to be used—sparingly. A straight staff is introduced; on it a probe-pointed straight bistoury is passed; and the urethra is notched, upwards and outwards, on each side—the knife's edge being chiefly applied at the neck of the bladder. Dilatation is then resumed; and extraction effected.

A stone has made its spontaneous exit from the female bladder, into the vagina, by ulceration.

Sometimes calculous matter collects at the lower part of

the orifice of the female urethra ; forming a concretion of greater or less size, which becomes imbedded in a partial dilatation of the canal—bulging into the vagina. The urine passes over it, freely but painfully ; it may produce most of the ordinary symptoms of stone ; yet, from its lateral and sacculated position, it may be overlooked in the introduction of a sound. It is a good rule, therefore, in cases of suspected stone in the female, to direct our attention to this part, after the bladder has been explored unsuccessfully.

Lithotripsy is not applicable to the female. The urine drains away so much, by the side of the instrument, as to empty the bladder speedily. And unless this viscus be tolerably full of fluid, the lithontriptor can never be used in safety.

CHAPTER XXXI.

AFFECTIONS OF THE BLADDER.

Cystitis.

THE inflammatory process, attacking the bladder, may be either acute or chronic ; and either form constitutes a most formidable disease. *Acute Cystitis* may be the result of direct injury ; as in Lithotripsy or Lithotomy. Or it may be a continuation, or a metastasis, of inflammatory action elsewhere ; as in gonorrhœa. Or it may be of idiopathic origin. Or it may follow the use of internal irritants ; as cantharides. Most frequently it is the consequence of virulent and ill-treated gonorrhœa. The symptoms are ;—pain in the region of the bladder, and also referred to the perineum and sacrum, sometimes stinging along the urethra ; tenderness over the pubes ; the urine voided very frequently, with great pain and straining—the pain being greatest after the bladder has been emptied ; the urine at first clouded with mucus, afterwards puriform in character ; sometimes, after the urine has passed, a small quantity of puriform matter is expressed with much suffering ; sometimes the urine is mixed with blood ;

sometimes, after the scanty and turbid urine has passed, pure blood escapes, in drops, or other small quantity. The system is affected by smart sympathetic fever. The action may extend by the external coat of the viscus, and general peritonitis result.

Spasm may simulate most of the symptoms ; but is known by absence of the inflammatory fever, and by the character of the pain—which, in spasm, is sudden in its accession, not gravescent ; rapid in its disappearance, and may be intermittent.

In the treatment of acute cystitis, antiphlogistics are to be applied actively. Blood is drawn from part and system ; fomentations and the hip-bath are used ; antimony, and if need be, calomel and opium are given ; opium, by the mouth or rectum, is usually indispensable—after bleeding—to subdue pain ; and the recumbent posture must be rigidly enjoined. This last indication is indeed imperative, in the treatment of all inflammatory affections of the bladder ; the erect and semi-erect postures tending obviously to favour determination of blood to the pelvic organs. The bowels are to be relieved by enemata, aided by the gentlest possible laxatives ; so as to avoid straining. During convalescence, the urine will probably require a special treatment ; varying, according as that fluid evinces an acid or an alkaline character.

Chronic Cystitis, or *Catarrhus Vesicæ*, is generally symptomatic of some other affection ; of gleet ; of stricture ; of enlarged prostate ; of stone in the bladder ; of hæmorrhoids, or other disease of the rectum ; of renal irritation. Sometimes, however, it is idiopathic. Micturition is frequent and painful, and the urine contains much viscid mucus. Often the recipient vessel seems almost entirely filled with mucus, thick, glutinous, and very adherent to the bottom. At first, it is greyish and streaked ; the streaks dependent on phosphate of lime ; afterwards it becomes brown, ammoniacal, and intensely foetid. Not unfrequently there is admixture of pus ; sometimes of blood. The mucous membrane is thickened and congested ; it may ulcerate ; the muscular coat is hypertrophied, and may sacculate ; the kidneys are sooner or later involved. By ulceration, it has happened that a communication

between the bladder and rectum has been formed. The system is affected invariably. And this is the diagnostic between catarrh, and mere irritability of the bladder. In the latter, the system is free ; in the former it is always involved, and that seriously.

In treatment little benefit need be looked for, unless the obvious cause, when it exists, be removed. Stricture must be cured ; stone must be taken away ; the rectum must be restored to a healthy state. Disease of the kidney and of the prostate may be palliated, but are not always easily removed. For the disease itself, opium is of great service ; allaying irritation, and lulling the inordinate action. The buchu and mineral acids are useful, as in alkaline urine from other causes. Regimen is generous, rather than otherwise ; to support the system. There is no tolerance of either purging or blood-letting. If the buchu fail, the *pareira brava*, or the *uva ursi*, is made trial of. Iron often is of great use ; and the best form is the tincture of the muriate. From a combination of benzoic acid with *copaiba* relief sometimes results. And counter-irritation is often of the greatest service ; on the hypogastrium, or over the sacrum—the latter the preferable situation. In severe cases, the actual cautery there may be warrantable ; to a very limited extent, however ; there being no tolerance, in the system, of the exhaustion and irritation of a large suppurating surface.

The following are the doses of the principal remedies. Opium in full doses, and repeated, so as to overcome pain and irritation. If opium disagree, *hyoscyamus* may be substituted. Of the mineral acids, the muriatic is usually preferred ; in a dose of eight or ten drops, gradually increased. The *pareira* is given in decoction. Half an ounce of the root, in three pints of water, is boiled down to one pint ; and of this from eight to twelve ounces may be taken daily ; or it may be given in the form of extract, to the extent of twenty or thirty grains daily. Of the buchu and *uva ursi*, in the form of strong infusion, ounce doses are given three or four times a-day. The tincture of the muriate of iron is given, in doses of from eight to fifteen drops twice daily. A drachm of benzoic acid, with half an ounce of *copaiba*, made into an emul-

sion with camphor mixture, may be taken in ounce doses, in the course of forty-eight hours.

The milder cases yield to such remedies. The more severe probably do not. In them, other measures must be had recourse to ; and the most promising is, injection of the bladder—never to be employed, however, except in aggravated cases, and after the ordinary means have failed ; otherwise it may itself prove the source of no inconsiderable injury. It is also essential that no acute or subacute exacerbation be present ; the disease must be thoroughly chronic. The injection is at first detergent and soothing ; water, or a decoction of poppies. Then a mixture of ten minims of dilute nitric acid with two ounces of distilled water is thrown in, and allowed to remain about thirty seconds. In two days, the injection is repeated, and the dose of acid is gradually increased ; by and by the injection may be given daily—not oftener. In extremely chronic cases, the bladder may be thoroughly washed out by means of a double catheter, to the main orifice of which a small enema-syringe is adapted, and by means of which apparatus a strong and continuous current is established in the viscus. Should at any time pain or even uneasiness follow the use of this means, however, the practice must be discontinued.

In very obstinate cases, it may perhaps be allowable to make a cautious trial of the application of nitrate of silver, in substance, to the mucous coat, as proposed by M. Lallemand. The bladder having been emptied, the porte-caustique is passed ; and the stilette having been pushed forwards, a momentary contact of the nitrate silver with the lining membrane is permitted. The instrument is then withdrawn ; and the caustic, dissolved in mucus, pervades the viscus. This is to be done very warily ; and the after consequences must be anxiously watched, lest over-action ensue.

Irritable Bladder.

In the healthy states of the urine and bladder, the stimulus of the former operates on the latter only according to

quantity ; a certain amount of fluid having accumulated, an uneasy sensation is felt, and the bladder contracts in obedience to that stimulus, seeking relief thereby. If the urine be anormally acrid, however ; if the mucous membrane of the bladder be morbidly sensitive ; or, more particularly, if both of these states exist together—the ordinary stimulus of the urine is found to be intolerable, and frequent, uneasy micturition results, constituting the affection termed Irritable Bladder. Pathologically, it differs from any form of cystitis, in depending on irritation, and not on the inflammatory process ; there is not necessarily any structural change in the coats of the bladder. Practically, it is known by the absence of grave constitutional disorder, as well as by the absence of profuse secretion of vitiated mucus—the prominent characteristics of *Catarrhus Vesicæ*. No doubt, however, these affections may and do, not unfrequently, coalesce ; the irritation inducing inflammatory action, and becoming merged therein. Concussion and compression of the brain are often associated, yet are regarded as distinct affections ; and so here.

The symptoms of Irritable Bladder are—frequent micturition, with uneasiness rather than actual pain ; the desire is very frequent, and almost constant—the slightest quantity of accumulated urine proving an unnatural stimulus to the irritable mucous coat ; and relief is obtained, on evacuation being completed. The pulse and general system are comparatively unaffected. The urine may be limpid and clear ; frequently it is clouded by mucus ; not unfrequently it emits deposit of the urates. The cavity of the bladder is contracted ; but without structural change. In some cases, the coats have been found thinner than in health. The source of the irritation may be in the mucous coat itself. More frequently it is elsewhere ; affection of the kidney ; ascarides, hæmorrhoids, or other disease of the rectum ; calculus, or other irritation in the urethra ; in children, it not unfrequently depends on a contracted state of the præputial orifice. Most frequently, the affection is found to originate in derangement of the kidney and of the general health ; and this at once gives the two component parts ; the acridity of urine, and perverted sensibility in the mucous coat. Indeed, these mor-

bid states very seldom are separate; for if irritation commence in the bladder, it is thence extended to the uro-poietic system, and derangement of secretion necessarily follows.

Treatment consists in looking for a cause, and in removing it, if possible; amending the stomach, bowels, and general health; and restoring the urethra, rectum, and other parts to a sound state. By anodynes, given by both mouth and anus—but especially in the latter way—the irritation is subdued. And, throughout, a constant regard is had to the state of the urine. The small doses of alkali, largely diluted, are generally found to be very serviceable. Recumbency is advisable; at all events in cases of severity. And should these simple means fail, recourse is had to smart counter-irritation; by blistering above the pubes, or over the sacrum.

Mental anxiety induces a temporary simulation of this disease; or, perhaps, it may be said to cause a variety of it. The mucous coat is increased in sensibility, and the whole frame is in unwonted excitement. The urine is not acrid; on the contrary, it is copious, pale, aqueous, and bland; and stimulates by quantity, rather than by quality. In this case, hyoscyamus and other direct sedatives are all powerful; together with attention to the manifest cause of the disorder.

Hæmaturia.

By this term is understood, a spontaneous discharge of blood from the urethra. It may proceed from different sources. 1. *From the Kidney.*—Stone in the kidney is often accompanied by discharge of blood from the mucous membrane in contact with the stone; more especially after violent exercise, error in diet, or other source of aggravation in gravel. Blows on the renal region cause hæmaturia; the blood in such a case sometimes passing in large quantity. Occasionally the occurrence takes place, without any assignable exciting cause, in cases of structural disease of the organ. The renal source of the hæmorrhage is known, by the blood being diffused equably through the urine; by the expelled fluid containing cylindrical portions of fibrin, like small worms, the result of coagula in the ureter—sometimes

colourless, sometimes of a pale pink hue ; by the appearance of blood being preceded and accompanied by pain and heat in the loins, and other renal symptoms ;—and more especially when such symptoms are present on one side only. The treatment consists in such means as are best calculated to remove the cause. In the case of external injury, rest, fomentation, low diet, leeching if necessary. In the case of stone, the palliative, or more thoroughly remedial measures, which we have already seen to be suitable in this disease. In the idiopathic hæmorrhage, connected with a generally relaxed state of system, and threatening exhaustion by continuance, such remedies as are useful for passive hæmorrhage—more especially rest, the local application of cold, and the internal use of gallic acid.

2. *From the Bladder.*—This is the most frequent variety ; as already seen, a very constant attendant on vesical calculus ; and then liable to be aggravated by circumstances. It may also proceed from a congested or inflamed state of the mucous membrane, unconnected with the presence of any foreign body. More or less, it is common in cystitis. From ulceration of the mucous coat it cannot fail to occur. But perhaps the most frequent source, next to that of calculus, is enlarged and ulcerated prostate. And if this state co-exist with calculus, the loss of blood is likely to be both large and frequent. Malignant tumour of the bladder, as it ulcerates, must furnish blood ; and a large amount may flow from injury done to the coats of the viscus, by ill managed catheters, bougies, or lithontriptors. Worms lodge in the bladder ; sometimes, though rarely ; and they have been known to occasion a profuse and even fatal loss of blood.

Vesical hæmorrhage may be so profuse as to furnish blood tolerably pure from the urethra. And, in general, this variety of hæmaturia may be known, by the blood not being mixed with the urine ; the latter fluid passes off first, tolerably pure ; and the blood comes last, more or less changed by mixture with the residue of the urine. It is also known by the absence of renal symptoms ; and by the presence of undoubted signs of stone in the bladder, or other disease of that viscus, or of affection of the prostate. In the case of direct injury done to the bladder by instruments, there need

be no room for doubt. Treatment, varying according to the cause, is plain and obvious, and need not be particularized.

Sometimes blood escapes in large quantity—in the case of stone, or enlarged prostate—and accumulates in the bladder; coagulating, and causing retention of urine. A hard tumour is felt in the hypogastrium; the ordinary distressful signs of retention are all present; on introducing the catheter, only a small quantity of bloody urine passes off; the fibrinous clot may be felt plainly enough, on moving the instrument's point; and, on withdrawing the catheter, it is found more or less obstructed by coagulum. If the symptoms be not urgent, we may content ourselves with occasional introduction of the catheter, to remove what loose fluid there is; the coagulum gradually dissolves in the urine, and comes away. If urgency exist, however, it is advisable to inject a small quantity of warm water; and then, by the exhaustion of a powerful and well-fitting syringe, to endeavour to break down and remove at least some of the clot. In the case of spontaneous disruption of stone, attended with such complication, it seems to be expedient to have instant recourse to lithotomy, provided the state of system be found sufficiently tolerant of such a severe proceeding.

3. *From the Urethra.*—In this case, there is absence of both renal and vesical symptoms; the blood passes pure, irrespective of any desire to evacuate the bladder; and there is usually some plain cause for the accident—as injury, inflammatory action, erection in chordee, or excessive venereal excitement. The application of cold, with recumbency, usually suffices for arrest. In extreme cases, following chordee, pressure may be made on or near the orifice, and at the perineum; so as to include the source of bleeding between the two points—preventing escape in either direction, and converting the effused blood into its own hæmostatic. In the case of wound, the ordinary principles of surgery are to be put in force.

Enuresis, or Incontinence of Urine.

Practically, this affection may be divided into that which affects the adult and the aged, and that which occurs in children. In the former, one of two events has taken place. Re-

tention of urine has taken place ; the bladder has become greatly distended ; and the recently secreted urine, finding no room in that viscus, dribbles away slowly and involuntarily by the penis. In other words, the incontinence in this case is but a symptom of a more serious affection—retention of urine. Or, as more frequently happens in the aged, the parts have simply lost their tone ; the expelling power is small, while the retaining power is almost or wholly gone ; and the urethra is little more than a passive tube, through which the urine flows outwards, shortly after secretion. In the former case, treatment is by the use of the catheter ; directing our attention to the true disease—retention. The other form is to be regarded as but one of the many signs of senile decay, and is treated accordingly. Temporary relief may in some cases be afforded, by the internal use of the *nux vomica* ; a degree of tone being restored to the parts for a time. But, in general, we have to content ourselves with attention to comfort and cleanliness, by the wearing of urinals adapted to the circumstances of the case.

In the adult, incontinence of urine sometimes follows rheumatic or other fevers ; it may result from injury of the spine ; and it is an ordinary symptom of the slow degeneration of the spinal cord formerly spoken of, (p. 324.) *Nux vomica* or *strychnia*, *cantharides*, and tincture of the muriate of iron, with blistering over the sacrum, are the most likely means of benefit. In some cases, the application of electricity to the parts affected has been of service. The remedies are plainly of that class which tend to restore muscular and nervous energy.

Enuresis in children is extremely common ; very much allied to irritable bladder ; but differing in this, that while, in the latter affection, evacuation of the bladder is voluntary, in this case it is involuntary. During the day, the child makes water with unusual frequency, perhaps ; at night the urine is passed involuntarily ; and this unpleasant habit may continue in adolescence. Corporeal discipline may yet be the favourite remedy among nurses, and with some parents ; but it is as ill-judged, as it is cruel and unnatural ; the child might as well be punished for club-foot or the measles. The involuntary escape of urine is the result of a morbid state,

and requires a curative treatment. Usually, the general system will be found out of tone ; and this is to be obviated by the ordinary remedies ; more especially by cold bathing, and by small doses of the tincture of the muriate of iron. At certain stated hours, during night, the child should be awakened for the purpose of emptying the bladder ; and, if possible, he should be prevented from sleeping on his back, and from so exposing the most sensible part of the bladder to the main contact of the urine. The bowels must be kept in good order ; and the state of the rectum must be especially attended to. *Ascarides* may probably be found there ; if so, they must be expelled. Certain means are supposed to have a special effect on the bladder. The *nux vomica*, or *strychnia*, is certainly of use ; perhaps by allaying irritation, as well as by increasing tone at the neck of the viscus. The nitrate of potass has proved serviceable ; and, in such cases, it is probable that the urine was scanty, acrid, and consequently unusually stimulant. In other cases, the more ordinary means having failed, benefit has accrued from the use of *cantharides* internally ; and in such cases, probably, there was a sluggish condition of the neck of the bladder and adjacent parts. The effect of this remedy has also been explained, by supposing that, acting as an irritant on the lining membrane of the urethra, especially at its posterior part, it produces turgescence there, and that, in consequence, the potential canal is less easily opened up. Amendment has not unfrequently followed the application of a large blister over the sacrum ; but whether by the principle of counter-irritation, or from sleeping on the back being thus effectually prevented, it is not easy to determine. Mechanical means—as the *jugum penis*—are not to be thought of.

It may happen that a boy, ashamed of his infirmity, and perhaps impelled by the desire to escape corporeal punishment, voluntarily has recourse to mechanical aid ; and, at bed-time, constricts the penis by a ligature, or a curtain ring, or other suitable means which may occur to him. In the morning, he finds the parts swollen and painful ; he is unable to remove the *jugum* ; and, afraid of the consequences of a disclosure, he suffers in silence. The swelling increases ; ulceration takes place ; the foreign body becomes

imbedded in the inflamed tissues ; the penis may be gradually cut through ; and, the urethra having been at length reached, a calculus begins to be constructed there. Such cases have been recorded by Liston, Helot, and others. Contrary to expectation, the erectile capabilities of the organ do not seem to have been impaired by the gradual transverse section. If called to such a case, after some days, with the constricting agent sunk in inflamed parts, a free incision is to be made upon the offending body ; which, having been exposed, is to be divided—by knife or pliers, according to its nature—and removed. If called early, a tight ring may be taken off, as from the finger, thus ; pass the end of a stout and long thread beneath it, leaving the pubal end loose and prehensible ; roll the rest of the thread tightly and closely round the penis, in front of the constricted part, so as to invest it wholly ; then gradually unrol, from the pubal end ; and the ring is shuffled forwards, as the thread is made to uncoil.

Retention of Urine.

This serious calamity may arise from a variety of causes ; and the treatment varies accordingly. The symptoms are : —inability to evacuate any urine, while the desire to do so is great, constant, and frequently aggravated—with straining, pain, and much distress. The bladder, rising in the pelvis, is felt above the pubes, and also by the finger introduced into the rectum ; pressure above the pubes causes great pain ; in extreme cases, the bladder may become an abdominal tumour almost as large and distinct as a gravid uterus—oval, tense, and fluctuating. If the bladder have been previously contracted in cavity and thickened in its coats, the ordinary symptoms of retention may be occasioned by the incarceration of but a small quantity of fluid ; and then the tumour can be felt only by the rectum or vagina. In other cases, the bladder distends readily ; and the tumour may be both large and high in the abdomen, before unpleasant feelings are complained of. As the case proceeds, the pain and straining, with sickness, become more and more unbearable ; the pulse rises, the skin grows hot, the tongue is dry ; breath and perspira-

tion may evince an urinous odour ;—" urinous fever" is established ; absorption of the vesical contents has begun. The ureters have become distended, as well as the bladder ; increasing pressure is thus made upon the kidneys ; their secretion is arrested in consequence ; and this suppression of urine, supervening on and caused by the retention, tends to produce coma and death.

If the bladder be relieved, the urgent symptoms disappear speedily ; the patient passes from torment to Elysium ; and under no circumstances will he be found more grateful for relief. He must be seen again soon, however, otherwise the unpleasant symptoms may be speedily restored. The kidneys, compressed by the enlarged and full ureters, have for some time been secreting little ; on removal of that pressure, the secretion is renewed very copiously, and the bladder may be soon refilled.

If no relief be afforded, a serious local accident is likely to occur, before the system has become fatally prostrate. The bladder or the urethra gives way ; either by ulceration, or by actual tearing under strong action of the detrusor ; and extravasation of urine takes place—of urine, be it observed, deprived of much of its aqueous part, intensely saline and acrid. The inevitable result is sloughing of the infiltrated parts ; too often followed by rapid sinking of the patient. Obviously, therefore, it is of the utmost importance to afford early and effectual aid in this affection.

1. *Retention from Stricture of the Urethra.*—In this case, perhaps the most common, danger is especially great ; the thickened and powerful middle coat of the bladder labouring hard to overcome the obstacle to evacuation, and consequently rendering solution of continuity all the more imminent.

The patient has long been in the habit of making water tardily and ill ; at last the passage seems effectually closed ; and the ordinary distress of retention supervenes. Probably an exciting cause may be found ; indiscretion at the dinner-table, exposure to cold or wet, or an attack of piles. The previously narrowed canal has become occluded by congestion, or by the swelling attendant on an active inflammatory process, in the affected part ; and, no doubt, there is also spasm of the adjacent muscular fibres.

If the history of the case and its symptoms be such, as to lead us to suppose that the strictured urethra is inflaming or inflamed, the catheter must be withheld ; unless indeed the case be already far gone, and the safety of the parts from extravasation already endangered. Leeches are applied to the perineum, in clusters ; or cupping is had recourse to ; the patient is seated in a warm hip-bath—and this bath need not be delayed till leeching is over, as the animals will not be disturbed by comfortable immersion. An opiate is given, by the mouth or by the anus. Very probably, such relaxation occurs as to preclude the use of the catheter ; the urine dribbling away in the bath, and then perhaps coming in a tiny stream, sufficient to relieve all urgency of symptoms. In the event of failure, however, after a reasonable time and trial, the bladder must be relieved at all hazards.

In those cases where we have no reason to suspect the presence either of spasm or of the inflammatory process, the catheter is used at once ; of small size, steadily yet gently persevered with. Sometimes the silver instrument refuses to pass, while the gum-elastic one, straight, and deprived of its stilet, glides into the bladder with comparative ease. Sometimes it happens, that after the end of a silver catheter has been pressed steadily for some time on the stricture, and withdrawn, the urine begins to follow. In no case is force or violence to be employed. But, when unsuccessful with the catheter, and the auxiliary means already noticed, the knife is to be taken up ; and by it we relieve the bladder, through the perineum, at the same time dividing the stricture. (P. 490.)

2. *Retention from Urethritis.*—The inflammatory process may attack the urethra, independently of previous stricture ; causing turgescence and occlusion. This may be the result of gonorrhœa, or of direct injury. The retention supervenes gradually ; and there is time for antiphlogistic treatment. To this we trust ; leeches, fomentation, hip-bath, antimony, &c. ; withholding the catheter, if possible ; inasmuch as its use, even though successful in relieving the bladder, must greatly aggravate the inflammatory action, and tend to repetition in a worse form.

3. *Retention from Irritation and Spasm at the Neck of the Bladder.*—This may take place, irrespective of inflammatory

action, or of organic change. In the dissipated, it is no uncommon result of a late carouse ; calls to evacuate the bladder, it is probable, having been imprudently neglected. A hip-bath, with an anodyne—opium or hyoscyamus, by the rectum or by the mouth—will usually give relief. If not, a full-sized catheter is to be passed, gently.

4. *Retention from Priapism.*—Priapism is a common result of spinal fracture ; and sometimes it occurs in connexion with venereal excess. In the former case, we cannot expect benefit from direct treatment of the cause ; and we must use the catheter. In the latter, by opium and camphor, and antimony ; by the warm bath ; by an opiate enema or suppository ; and by leeches to the part, if need be—we may overcome the erection, and avert the use of instruments.

5. *Retention from Abscess in the Perineum.*—Abscess forming here—in connexion with stricture, or as a result of direct injury—may bulge internally, so as temporarily to occlude the urethra. The use of the catheter would be very painful, and not unlikely to cause a giving way of the abscess into the urethra, whereby urinous extravasation might occur. The knife supersedes the catheter ; the abscess is opened from without ; instant relief follows ; the retention is overcome, and the morbid state which caused it is at the same time removed.

Similar treatment may be required, on account of an abscess forming in the body of the penis, as a remote result of venereal disease.

6. *Retention from Urethral Calculus.*—This occurrence has been already alluded to ; impaction of a calculus taking place, in such a way as quite to occlude the canal. Three courses of procedure are open to us. We may, by the catheter, push back the calculus into the bladder, treating it afterwards by lithotripsy. Or we may at once remove it by direct incision. Or we may bring it to the orifice of the urethra, and thence extract it—by dilatation if necessary. If the stone is small, movable, and situated anteriorly, we prefer the last mode ; if it is impacted in the prostatic portion of the canal, we probably prefer the first. If it is of some considerable size, firmly impacted, and beyond the prostatic portion, we have recourse to excision.

7. *Retention from Injury of the Perineum.*—1. Extensive

bruise of the perineum may cause retention, irrespective of any injury done to the urethra; the extravasated blood bulging inwards on the canal. In such a case, the catheter must be used, until by absorption the compressing agent has been diminished or taken away. 2. Again, injury of the perineum may induce an inflammatory action, either in the urethra itself, or in the parts exterior to it; and, in the latter situation, abscess may form. The treatment advisable under such circumstances has already been stated. 3. When the urethra has been torn or cut, there is no room for delay; retention must not be waited for; the catheter cannot be too soon introduced. For, if the patient have made an effort to evacuate the bladder, before such introduction, the urine will certainly escape at the injured part, causing all the deadly results of extravasation. And only by early introduction of the catheter—retaining it until consolidation shall have taken place at the injured part—can extravasation be avoided. If the urethra have been completely torn across, there may be difficulty in passing the instrument; nay, not improbably, the surgeon may be altogether foiled in his attempt to penetrate the vesical orifice—shrunk, retracted, and displaced. Under such circumstances, a free incision must be made so as to expose the part; and then the catheter is passed through and retained. It is surely much better to make a limited incision, with the view of preventing extravasation, than to be compelled to incise largely afterwards, for the escape of sanies and sloughs.

8. *Retention from Paralysis.*—A paralytic state of the detrusor may be the result of accidental over-distension merely; of spinal injury; or of senile decay. The ordinary call to evacuate the bladder having again and again been neglected, under circumstances of restraint, the sufferer, when liberated from these, will probably find no urine coming in obedience to his utmost efforts at expulsion. The muscular fibre of the detrusor has been over-stretched, and, for the time, is paralyzed. The catheter cannot be used too soon; and its introduction is to be repeated from time to time, never allowing any considerable quantity of urine to collect; so that the normal dimensions of the bladder, and the wonted functions of its muscular coat, may be speedily restored. Should the

return of contractility be slow and imperfect, strychnine or nux vomica may be given, or electricity may be employed.

In the case of spinal injury, the circumstances are very distressful ; for, in addition to retention being ever liable to occur, there is the phosphatic degeneration of the urine, with more or less change in the lining membrane of the bladder. The prominent symptoms of retention, however, are probably less urgent than in other cases ; there being usually diminished sensation in the viscus, as well as impaired muscular power. Occasional relief, too, may come, by partial escape of urine ; for, the abdominal parietes may act on the bladder when greatly distended and risen ; taking on themselves, in some measure, the lost function of the detrusor. Also, as the bladder changes in its coats, the middle coat, becoming hypertrophied, may acquire an increase of power, so as to effect a partial evacuation ; “ the muscular coat, which is not excited to contraction so long as the mucous coat is in a healthy condition, acquires a degree of anormal contractility.” In such cases, the treatment is mainly spinal. The catheter is used from time to time ; the usual means are taken to correct the depraved state of the uro-poietic system ; and, during convalescence, recovery of power in the muscular coat may perhaps be promoted.

In the aged, the detrusor, as other muscles, grows feeble ; and, by reason of this, retention may occur. Relief is got by the catheter ; and something may be done in amending muscular energy—at least for a time.

9. *Retention from diseased Prostate* ; it may be, from either an acute or a chronic enlargement of the gland. In gonorrhœa, the gland is liable to the occurrence of acute swelling, with or without the formation of matter ; and this may be to such an extent as to shut up the posterior part of the urethra. The treatment is by antiphlogistics ; withholding the catheter, if possible. If abscess have formed, it must be evacuated externally, by incision ; as in the case of similar affection of the perineum. In the chronic enlargement of the prostate, peculiar to advanced years, relief can be had only by the catheter. And an instrument must be employed, of large curve, and at least two inches longer than that in ordinary use ; for, by the prostatic enlargement, as well as by elevation of the blad-

der when distended, very considerable elongation of the urethra takes place, and an ordinary instrument must necessarily fail to reach the bladder.

It is in this form of retention that incontinence of urine is so apt to show itself as a symptom. For years, perhaps, the bladder has been imperfectly evacuated; a certain amount of residuary water has always lodged in that viscus; and the amount increases; at last, the bladder becomes completely distended, and the urine which comes fresh from the ureters—as surface water—dribbles over and is involuntarily discharged.

Very frequently, the kidneys become diseased. In such a case, the catheter must be used very cautiously. Were it to be passed at regular periods daily, fully evacuating the bladder on each occasion, it is probable that the kidneys, deprived suddenly and completely of the circumstances which had so long tended to restrain their secretion, would become untowardly excited, and fatal aggravation of the renal disease might ensue.

10. *Retention from Blood in the Bladder.*—If this occur in connexion with spontaneous disruption of a vesical calculus, lithotomy is probably the best remedy, as already stated. In other circumstances, we have recourse to a full-sized catheter, with large eyelets; and aid its action, if need be, by an exhausting syringe. The ordinary hæmostatic means are at the same time had recourse to, to prevent continuance of the internal hæmorrhage.

11. *Retention from Malignant Disease of the Penis.*—As carcinoma or cancer advances in destruction of the penis, secondary glandular enlargements occur, both without and within the pelvis; and, in consequence, the outlet of the bladder may come to be completely obstructed. In such retention, we can only hope to palliate, and briefly to extend the now closely meted term of existence. The bladder is relieved by puncture above the pubes, and the aperture is kept pervious.

12. *Retention from Imperforate Urethra.*—This is a state of matters analogous to retention of the meconium, by an imperforate condition of the anus. (P. 413.) The perforation necessary to complete the canal cannot be too soon accomplished.

Retention of Urine in the Female.

The most ordinary causes of this affection are ; pregnancy, tumours, paralysis, and hysteria. The gravid uterus is likely to compress the urethra ; more especially about the fourth month, when the tumour is considerable, and not yet risen out of the pelvis. Relief is by the flat catheter. Other tumours may compress and obstruct the urethra ; uterine, ovarian, vaginal. Here again—as well as in the case of paralysis—the catheter is employed. But, in the last variety of cause, it ought generally to be refrained from. Hysterical women very often labour under retention of urine, simply because they refuse the effort of volition necessary for expulsion of the bladder's contents. Use the catheter, and repetition of the retention speedily occurs, the cause remaining the same. But refuse the catheter, and allow distention to proceed, until the stimulus thereby occasioned becomes such as to compel the detrusor to its function ; and then, by an effect partly moral and partly physical, the patient will find herself permanently relieved. There are obstinate cases, however, which resist this mode of cure ; and, in them, care must be taken not to endanger the bladder, by an excessive withholding of the catheter.

Puncture of the Bladder.

This operation becomes necessary, when urgent retention of urine exists, and when, by the use of the catheter, we have failed to afford relief. It may be performed in a variety of ways ; by the perineum, by the rectum, or above the pubes. 1. *By the Perineum.*—This is preferable in all cases of obstinate retention, caused by impassable stricture, or other obstruction of the urethra ; the bladder is safely relieved, and the cause is at the same time effectually opposed. The patient is placed in the position of lithotomy ; a catheter of a medium size is passed down to the constricted part, and is cut upon by direct incision, in the central raphé ; behind the end of the instrument, the bulging dilatation on the vesical aspect of the stricture will be felt ; this is pierced by the knife ; and the urine rushes out, affording complete relief to

the bladder. Then the knife is carried forwards, so as to divide the constricted part of the urethra. That having been laid open, the catheter is passed on and retained ; and thus a most effectual beginning is made in the treatment of the stricture. It is rarely, however, that this operation is demanded of the experienced surgeon ; generally, he succeeds by the catheter and its auxiliaries.

But this may be said to be puncture of the urethra, rather than puncture of the bladder ; and so it is. In strict accuracy, perineal puncture of the bladder may be held to denote the reaching of the neck of that viscus, by means of a small lithotomy wound—an operation which is very seldom performed for mere retention.

2. *By the Rectum.*—This is a simple and safe operation ; but is apt to leave a troublesome fistulous communication between the bladder and bowel. We have recourse to it, when foiled both in the use of the catheter, and in the attempt at perineal puncture ; and, indeed, it may be performed in any case, by a surgeon who prefers it, except when the prostate is much enlarged. The patient is placed recumbent, with the limbs elevated. The fore and middle fingers of the surgeon's left hand are introduced, well oiled, into the rectum ; and their points are rested on the central space immediately behind the prostate. A curved trocar is introduced by the right hand, with its stilet withdrawn within the canula ; the extremity of the latter is fixed on the *trigone*, between the points of the fingers resting there ; and, the stilet being then pushed forward, both the trocar and its canula are lodged in the bladder. The trocar is withdrawn, and the canula is retained. If there be a good prospect of speedy removal of the cause of retention, the canula may be very soon taken out. Otherwise, it must be retained for some days, so as to prevent premature closure of the wound.

3. *Above the Pubes.*—This is our last resource ; when both the other methods are deemed impracticable. The operation is similar to the supra-pubal lithotomy. A small incision is made through the parietes, immediately above the symphysis ; and through this the bladder is punctured at its lowest part, by means of a short trocar and canula—similar to what is used in ascites—directing the point of the instrument obliquely

backwards, towards the promontory of the sacrum. The canula is left ; or a portion of elastic catheter ; or a short lithotomy tube. And the patient is laid on his side, so as to favour the outward escape of urine.

These methods of operation have been enumerated, according to what is conceived to be their merit. All are rare, in actual practice ; and deservedly so ; for none are of a favourable character. But any one of them is much preferable, at any time, to a postponement of relief, and consequent disaster by extravasation.

Extravasation of Urine.

This may be either vesical or urethral. The *Vesical*, as we have already seen, may follow wound, ulceration, or tearing of the viscus. 1. After the wound of lithotomy, it is too common ; 2. Cystitis may lead to perforating ulcer ; 3. Retention of urine may be relieved only by a bursting of the bladder, or by a more gradual giving way by ulceration. Actual laceration, however, is not uncommon ; and it is not difficult to understand why. The cohesion of the parts has been previously diminished, by the inflammatory process occurring in them ; and, themselves unusually lacerable, they are acted on not only by a hypertrophied detrusor, but also by the muscles of the abdominal parietes and the diaphragm. The nature and treatment of the first form has already been considered. The second is hopeless ; the patient will necessarily perish, by peritonitis, or by cellular infiltration and sloughing, according to the site of the urinous escape. In the last form—that occurring by unrelieved retention—there is but little hope ; yet there is some room for treatment. During a violent effort to overcome the obstacle to expulsion of urine, something is felt to yield, and relief is experienced and expressed ; yet—probably to the patient's surprise—no urine is seen to come by the penis. By and by, the sense of relief and comfort passes off ; a burning heat is felt in the infiltrated part ; and the constitutional symptoms, attendant on the asthenic inflammation and gangrene, which must follow, declare themselves in their most formidable shape, rapidly becoming more and more typhoid, and soon ending in fatal collapse. Or, if the viscus

have fortunately given way at its most anterior part, the local mischief may advance outwardly, and perhaps evacuation by the perineum may occur, with more or less relief. The treatment obviously consists in reaching the infiltrated part, if possible, by an early, free, and dependent incision; and in maintaining the powers of the system, under the strong depressing agent so busily at work, by every means in our power. No case, in which an outward and efficient opening has been afforded, is to be considered too desperate. Nourishment and stimuli must be steadily administered. Unexpected and wonderful recoveries have rewarded perseverance.

Urethral Extravasation is the more common. The urethra gives way, by ulceration, at some part of its course; and the bladder remains entire. There may not be the same sensation of something having yielded during straining; but there is, generally, the same feeling of relief having been obtained. Soon, however, there is a painful undeceiving; the infiltrated parts become hot, swollen, red, black, dead; a urinous odour seems to exhale from the whole body, but more especially from the parts affected; and the ordinary typhoid irritation of system becomes more and more developed—low and rapid pulse, black tongue and mouth, sunk and anxious features, cold clammy skin, hiccough, muttering delirium. The site and amount of local mischief depend on the part of the urethra which has given way. Not unfrequently, it is behind the bulb; and the urine, restrained, at least for a time, by the deep fascia, burrows deeply. In such a case, the local signs may be obscure; the scrotum being uninvolved, and the perineal swelling and discolouration at first indistinct. Should the glans penis be found swollen, hard, and blackening, it is a sign of the corpus spongiosum being infiltrated, and an omen of most sinister import. In such cases, an early and free incision, in the centre of the perineum, affords the only chance of relief and safety—the knife being pushed determinedly down, so as not merely to expose the surface of the infiltrated parts, but also to lay bare the source of the extravasation. When the giving way has occurred at a point anterior to the deep fascia, the case is more plain and less hazardous. The scrotum, and the integument of the penis, sometimes the inside of the thighs, and the lower part of the abdominal parietes—not always the

perineum—become rapidly swollen, and of a dark red hue; then the integument blackens, crepitates, and sloughs; and, as the sloughs separate, urine and foetid sanies flow away. Long before this open state, however, the olfactory organs alone are sufficient for the diagnosis. In this case, the incisions do not require to extend so deeply, but are more numerous and extensive; leaving no part of the infiltrated textures without a free outward opening. Poultice and fomentation follow the knife; usually with active stimulation of the system. In a day or two, the poultice is superseded by water-dressing; and this again is medicated by the chlorides. The immediate hazard having been got over, and the parts having passed from excitement, means are taken to overcome the cause of the accident, and to restore the urethra to its normal condition. In the great majority of cases, a tight stricture is found, anterior to the site of ulceration.

The urinous irruption does not always take place directly from the urethra; there may have been a urinous abscess formed, as the first result of the stricture; and then, the parietes of this abscess having yielded, extravasation takes place outwardly. The results and treatment are the same as in the direct and ordinary variety.

Injuries of the Bladder.

This viscus may suffer in various ways, by the hand of the surgeon. In lithotomy, it may be unnecessarily cut, or bruised and torn by the forceps or scoop. In lithotripsy, it may be pinched, bruised, or torn, by a rash and inexperienced operator. By the catheter, too, it may sustain hurt. The risks are, hæmorrhage, and inflammatory action; to be obviated by the means already considered.

Not unfrequently, the bladder suffers by accident. The pelvis is broken; and a spiculum of bone, projecting inwards, is liable to penetrate the viscus, more especially if it happen to be distended with urine. Urinary infiltration can scarcely fail to occur; and probably to such an extent as to prove rapidly fatal. Or laceration may take place, in consequence of a blow or bruise; and it is well to remember, that this result may follow an application of violence apparently by no means

great, if the bladder happen to be at the time full of urine; blows, kicks, falls have often proved thus fatal; in the female it has occurred, from merely the superincumbent weight of another person. Ordinarily, however, the force applied is considerable. And, unfortunately, the portion of the viscus which is most apt to give way, is where it is covered by peritoneum, near its fundus; the outer coat, less extensile than the rest, is most apt to tear; and, besides, the force is likely to jam this part of the bladder on the promontory of the sacrum. There is great pain in the region; only a small quantity of urine comes by the urethra, and that is more or less mixed with blood; no tumour of distended bladder can be felt by the rectum or vagina; the catheter draws off but little fluid, and that is bloody; by and by the ordinary signs of urinary infiltration are declared. The treatment consists in the immediate introduction of a catheter, which is retained; and in attempts to support the system, under the amount of infiltration which may occur.

In the parturient female, the distended bladder is apt to suffer. By the instruments in extraction of the foetus, it may be torn; by long-continued pressure of the head of an impacted foetus, it may be induced to slough or ulcerate. Vesico-vaginal fistula is the result; in the event of recovery with life.

Tumours of the Bladder.

Fortunately this is a rare affection. The interior of the viscus, however, is occasionally the seat of tumours; and these are of two kinds. Simple mucous polypi may form there, in considerable numbers; simulating the ordinary symptoms of stone. The sound finds no calculus, but may be felt impinging on a soft and movable substance, obviously extraneous to the bladder's coat. It has been proposed to deal with this by means of the lithonriptor; but the prospect of success does not seem very inviting.

Malignant tumours may form; medullary; growing from the coats of the viscus—often near its neck, in apparent connexion with the prostate—and occupying the cavity to a greater or less extent. Micturition is frequent and painful;

and the pain is greatest immediately after the effort ; the urine is bloody and foetid, and often contains flaky substances, or masses of the disorganized tumour ; by impaction of these, occasional retention may occur ; a dull weight is felt in the loins ; and the pain of micturition is much more pelvic, and more extensive there, than in the case of stone ; also the sound, on encountering the foreign body, imparts quite a different sensation. There is no remedy for this disease. We can only hope to palliate, by opiates, and the recumbent posture. Sometimes the tumour, expanding, may cause retention, which is not capable of being relieved by the catheter ; and, in such circumstances, we are called upon to protract existence, by puncturing the bladder above the pubes.

Cancerous disease may extend from the rectum to the bladder, involving all in one large and loathsome sore. Malignant tumours also form between the two viscera, as formerly stated, (p. 410.) There is for such cases no cure.

CHAPTER XXXII.

AFFECTIONS OF THE PROSTATE.

Prostatitis.

THE prostate is liable to be affected by an acute inflammatory process, during the progress of virulent gonorrhœa. And the action may also be excited ;—by direct injury of the part—as by a blow on the perineum, or rash usage of instruments introduced by the urethra ; by excessive venereal indulgence ; by imprudent exposure to cold and wet ; by sympathetic influence of affections of the rectum ; by the internal use of cantharides, or other irritants. Heat and pain are complained of in the perineum, near the anus, and there is tenderness on pressure there ; water is made frequently, and with pain ; and pain is greatest as the accelerator muscles exert themselves to expel the last drops ; there is a sensation of weight in the rectum ; and that bowel is evacuated with

both difficulty and pain ; the finger introduced into the rectum ascertains the prostate to be large, hot, and tender on pressure ; and an attempt to pass a catheter into the bladder is both difficult and painful—the difficulty and pain occurring when the instrument's point has reached the prostatic region. Not improbably, the action extends to the bladder, and then the ordinary symptoms of cystitis are added to those already described. The treatment is by rigid confinement to the recumbent posture, leeching of the perineum, hip-bath, fomentation, and opiate enemata or suppositories. Sometimes relief is obtained from large, warm, and emollient enemata, which may be supposed to act as a poultice applied directly to the part. Direct leeching has been proposed, by means of a tube, or speculum, introduced by the rectum ; but it is probable that the irritation, attendant on the application, will more than counterbalance the benefit obtained by such abstraction of blood.

Abscess of the Prostate.

When the above symptoms sustain sudden aggravation, with rigor, increase of swelling and tenderness in the perineum, greater difficulty of micturition, and greater swelling and tenderness on examination by the rectum, it may be presumed that matter is forming in the gland. Frequent examination is made, in order to arrive at a correct diagnosis ; and as soon as fluctuation can be discovered, however obscurely, a direct incision is made by the perineum, to procure outward evacuation. If an artificial opening be delayed, the abscess may open into the urethra—favouring the formation of urinous abscess ; or into the rectum, establishing a troublesome recto-vesical fistula ; or outwardly by the perineum, after much injury has been done to the intervening tissues. Spontaneous evacuation into the urethra is indicated by a copious purulent discharge from the penis. And then it is advisable to use a catheter, gently introduced, as often as the patient wishes to empty his bladder—for some days—so as to prevent, if possible, the untoward entrance of urine by the ulcerated aperture ; or a soft elastic catheter may be passed and retained.

Chronic suppuration of the prostate has been observed, causing much distress, with discharge of muco-purulent urine. On examination by the rectum, a soft point has been felt in the gland ; and, on pressing it, matter has escaped by the urethra. The plunge of a lancet or trocar, into the soft point, has given relief ; and troublesome fistula has not followed.

Simple Enlargement of the Prostate.

Simple enlargement of the prostate is of two kinds ; one the result of a chronic prostatitis ; the other a hypertrophy, independent of the inflammatory process ; the one not uncommon in the adult of middle age ; the other peculiar to advanced years. The former variety is dependent on stricture, or gleet, or affection of the rectum, or injury of the perineum by habitual horse exercise ; and disappears, usually, on removal of its cause. If not, recumbency is to be maintained, a few leeches are applied to the perineum, and they are followed by smart counter-irritation ; and, at the same time, the internal use of the iodide of potassium may be of great service. The bowels are kept gently open, by simple laxatives and enemata. In obstinate cases, an alterative course of mercury is expedient ; and, under this, amendment is sometimes both rapid and satisfactory.

Hypertrophy of the gland is usually regarded as but one of the many signs of senile degeneracy in the frame. As the eyes grow dim, the trunk bends, the cartilages ossify, and the arteries change in their coats—so the prostate is supposed to grow large and hard. The enlargement may be uniform, the whole gland seeming to expand equally ; displacing the urethra as well as compressing it, and consequently interfering with its function in regard to the urine. Or the central portion may enlarge, with much greater rapidity than the rest of the gland ; rising like a mamillary process ; projecting backwards into the bladder ; but, ever and anon, liable to move forwards, and so to act as an occluding valve to the outlet of the cavity. In general, the lateral lobes enlarge unequally, and consequently a twist is given to the prostatic portion of the urethra, in the lateral as well as in the vertical direction.

The symptoms of this simple hypertrophy are—an increasing slowness and difficulty in making water, uneasiness and difficulty in emptying the rectum, with a sensation of weight in that bowel and in the perineum ; sometimes the fæces are passed flattened, as in stricture of the rectum. On introducing a catheter, some difficulty is likely to be met with in passing the region of the prostate ; and when a finger in the rectum is made to press upwards on the catheter, the enlarged prostate is plainly felt between. Without the use of the catheter, tactile examination is never certain. As the tumour enlarges, the calls to empty the bladder are more frequent, and the act is less perfectly accomplished ; as formerly stated, a portion of residuary water remains, cooped up behind the enlargement. The bladder sympathizes ; it may become irritable ; more frequently, a degree of chronic cystitis is excited. The urine changes, in consequence ; becoming dark-coloured, foetid, and full of mucus. The vesical aspect of the projection may ulcerate, giving rise to hæmaturia, purulent urine, and aggravation of all the distress. The difficulty in micturition increases ; and at last—some casualty acting as an exciting cause—retention occurs. Generally, this has not existed long, before the “surface water” comes to dribble away ; and, by the establishment of incontinence, the retention is partially relieved, as formerly stated. It may happen, however, that the obstruction is complete ; and, by retention, the patient may perish. Or, the whole urinary system having become involved in disease, death takes place by gradual exhaustion. The treatment is but palliative. We cannot hope either to retard or to remove the enlargement. Every excess and imprudence is avoided, in diet and exercise ; and the recumbent posture is maintained as much as possible. The bowels are regulated by enemata and simple aperients. Opium is given occasionally ; and acids, iron, buchu, &c., are given, as the complication by chronic cystitis may seem to demand. To avert distention of the bladder, the catheter is used as often as may seem necessary. Excision of the gland has been talked of ; but scarcely in sober earnest.

When retention has occurred, the catheter requires a peculiarity of management. As already stated, the urethra

is considerably elongated ; and the catheter must be of a proportional length. The prostatic portion of the urethra almost invariably has a bend given to it, antero-posteriorly—that is, the convexity is towards the rectum, the concavity towards the pubes ; and, to suit this peculiarity of form, the instrument should have a large curve. Very frequently, the central enlargement—or “third lobe,” as it is usually called—exists ; and, to surmount it, it is well to have the point making a sharper curve upon the general bend of the instrument. It is introduced carefully ; and, to assist the point onwards, the handle is greatly depressed, after passing the triangular ligament ; while, at the same time, the point is elevated by means of the finger in the rectum. If the silver catheter, thus made and managed, refuse to enter, one of elastic-gum may be tried ; bent to the proper shape, and introduced with the stilet. On reaching the prostatic obstruction, the stilet is gently withdrawn, and the consequent elevation of the point may perhaps lead it over the obstruction. Or, the stilet being held steady, the tube is passed on, and the same effect is produced—the catheter’s point curving round that of the stilet, as it were.

Perhaps the obstruction proves insurmountable. The bladder must be relieved at all hazards ; and one or other of the following methods may be adopted. The catheter may be forced through the obstruction ; guided in a good direction, by the finger in the rectum. Or a trocar and canula may be used, instead of the catheter. Or the bladder may be punctured above the pubes. The operation by the rectum is obviously unsuitable.

Of these proceedings, puncture of the urethral obstruction is the most advisable ; by means of the trocar and canula ; the latter of the same length and calibre as a full-sized prostatic catheter, but considerably less curved. It is passed carefully on to the obstruction, with the stilet withdrawn, and the canula’s extremity temporarily occupied with a bulbous wire ; and, when satisfied, by the finger in the rectum, that the instrument is duly directed towards the bladder, the bulbous wire is removed, the stilet is protruded, and the whole is pushed on. The stilet is then wholly withdrawn, and the canula is retained for some days. When

the retention has been of long duration, and there is reason to believe that the kidneys are organically diseased, the urine is to be withdrawn gradually, for the reasons formerly adduced.

Malignant disease of the Prostate.

The gland is sometimes, though rarely, the seat of scirrhus. More frequently it is affected by medullary formation, which enlarges rapidly, ulcerates, bleeds, and follows the usual course of such tumours. The disease is not peculiar to the aged. It may occur in children, as medullary tumours in other sites so frequently do. The symptoms are similar to those of more ordinary enlargement, with the addition of those of tumours in the bladder, as well as of those which attend and characterize all malignant formations. The disease is incurable. By opiates, the catheter, enemata, and rest, we hope to palliate and protract.

CHAPTER XXXIII.

THE VENEREAL DISEASE.

THE history of the venereal disease is involved in some obscurity. However, it seems extremely probable—if not, indeed, quite certain—that affections of the genital organs, dependent on licentious venereal intercourse, have existed from the earliest ages; that they have prevailed, in various degrees of frequency and intensity, at different times and places; that they were not directly imported from America to Europe, by Columbus' followers, in the end of the fifteenth century; but that, between the years 1493 and 1495—at the time of the siege of Naples—they experienced an aggravation in Europe, and consequently attracted much more prominently the attention of the profession.

They are usually spoken of under the general term of "The Venereal Disease;" and this again is divided into Gonorrhœa and Syphilis; both the result of the application of animal virus, engendered by illicit intercourse,—or at least

communicated thereby ; the former an inflammatory affection of the urethra ; the latter, a contamination of the whole system, preceded by the formation of pustular ulceration on some part of the penis, or other part of the body. By some, it is still maintained that the poisons are the same ; that what produces gonorrhœa is capable of exciting syphilis, and *vicé versâ*. The weight of authority, however, preponderates largely in favour of an opposite opinion ; admitting, perhaps, that gonorrhœal virus is capable of causing the simplest form, only, of venereal ulcer ;—and even that concession is by many not granted.

Gonorrhœa.

An acute inflammatory process seizes on the lining membrane of the anterior part of the urethra ; caused by the application of gonorrhœal matter, from a second party ; and this application usually made during sexual intercourse. There is a period of incubation, of uncertain extent ; discharge may show itself within not many hours after connexion ; or it may be not till many days have elapsed. About the fifth day may probably be taken as the average period of accession. Heat and itching are felt in the glans, which seems fuller and more roseate than usual ; the urethral orifice is uneasy, red, and swollen ; the urine is passed in a small stream, and with increasing heat and smarting ; the orifice of the urethra shows an increased secretion ; then it becomes dry, more red and swollen and painful ; the stream of urine is more diminished, and the pain which accompanies it is intense ; then discharge returns—no longer limpid, but turbid and puriform—becoming more and more profuse, and ultimately seeming to consist of true pus ; if the action prove intense, there may be a considerable admixture of blood. Sometimes, a smart fever affects the system ; sometimes, there is but little constitutional disturbance. The thighs, loins, and testicles, sympathize in a dull aching sensation.

Such are the ordinary symptoms at the onset of the disease. But, in the course of its progress, serious additions may be made. 1. *Chordee* may occur ; that is, anormal erection may take place ; the penis becoming bent like a bow—the convex-

ity on the dorsal aspect—probably on account of exudation having taken place into the corpus spongiosum, so as to prevent uniform expansion of the erectile apparatus. Such erection is intensely painful, and tends to aggravate the disease; it is also liable to induce profuse hæmorrhage, probably by laceration of the mucous membrane. The tendency to chor-dee is greatest during sleep; while the patient is warm in bed, and perhaps excited by voluptuous dreams. Sometimes, its proximate cause would seem to be other than plastic exudation; normal and abnormal erections alternating with each other. 2. The glans may become excoriated, furnishing a profuse discharge; establishing what is termed Spurious Gonorrhœa. 3. The prepuce may become œdematous; inducing the condition of Phymosis, when the swollen prepuce maintains its ordinary relation to the glans; causing a Paraphymosis, when it is reflected behind the glans, and allowed to remain there. The former state aggravates the disease, by retaining discharge, and increasing the tendency to affection of the glans; the latter leads to a strangulation of the glans, and consequently to intense exacerbation there. 4. The lymphatics may suffer; becoming painful, red, and swollen, on the dorsum of the penis; or, without such indication, inflammatory enlargement may take place in the inguinal glands, constituting what is termed Sympathetic Bubo. 5. Abscess may form in the penis; on the dorsum; or beneath, opposite to the lacuna maxima. The latter is the more frequent site. A main residence of the inflammatory action—which, in the first instance, does not extend beyond two inches from the orifice—seems to be in this lacuna; which swells and becomes hard; filled with accumulated secretion internally, and externally invested by plastic exudation. In this exterior, true inflammation may occur, causing abscess of greater or less extent. 6. Or abscess forms in the perineum, at a distance from the original site of action—a less frequent complication; threatening retention of urine by compression of the urethra, and urinous abscess by opening internally. 7. Or, prostatitis ensues; sometimes, by continuous extension of the inflammatory process along the membrane; more frequently, perhaps, by a metastasis. And in severe cases—either originally and innately so, or become

urgent in consequence of either mal-practice, or imprudence on the part of the patient—abscess may form in the prostate; usually superficial; temporarily causing retention of urine; early emptying itself internally, and rendering urinous abscess not improbable. 8. Or, the inflammatory process extends still further, and more untowardly—either by continuity, or by metastasis; and acute cystitis results; aggravating all the local symptoms, and, by urgent disorder of the system, bringing even life into peril. 9. Acute rheumatism may supervene; the joints of the limbs becoming painful and swollen, and the system suffering under inflammatory fever. The knee and ankle-joints are those most frequently and prominently involved. The supervention sometimes takes place during the acute stage, sometimes during the decline; occasionally, the rheumatic symptoms are coeval with those of the gonorrhœa. Or, gouty symptoms may be excited, in those of the better ranks, and of advanced years. 10. Very often, in protracted cases, orchitis takes place; the inflammatory action sometimes seeming to be transferred to the testicle by metastasis, sometimes seeming to creep along from the posterior part of the urethra to the vas deferens, and thence to be extended to the epididymis and testicle—becoming mainly resident in the former. During the acute stage of the orchitis, urethral discharge diminishes, and may wholly disappear; not necessarily proving a metastasis, but explicable quite on the principle of relief by counter-irritation. As the orchitis declines, discharge usually reappears.

Orchitis may be caused at any period of the case, by a blow on the part, or by imprudence in exercise. If spontaneous in its accession, it usually occurs in the chronic stage; weeks, perhaps, after the first appearance of discharge.

Gonorrhœa is one of those affections which are capable of self-cure. The intensity of the symptoms gradually subsides; the complications which may have occurred are recovered from; and the discharge becomes less copious, and somewhat restored to the mucous character. This state is termed a *Gleet*—embers of the previous fire. There is little or no pain, swelling, or redness; the discharge is the prominent symptom; with, perhaps, some trouble in micturition. In a patient who has suffered from previous claps, a greater or less

degree of contraction in the urethra probably exists ; but, in primary attacks, the gleet need not be suspected of such complication. In any case, it is not to be considered that the gonorrhœa has finally ceased—becoming merged in the affection of another name ; for, from but a slight cause—as unusual exercise, an imprudence in diet, or such like—reaccession of the inflammatory process may take place ; and the gonorrhœa may be revived in even more than its pristine severity.

The *Treatment* of gonorrhœa varies, according to the stage of advancement. At the first onset, what is termed the ectrotic or abortive treatment may be attempted ; while the inflammatory process is still nascent, and has not reached the suppurative crisis. The nitrate of silver is used, as in a similar affection of the surface ; with the view of procuring rapid resolution, (*Principles*, 140.) It is applied, in the form of strong solution, to the affected part of the mucous membrane—carefully, by means of a glass syringe, so as to pervade the whole diseased surface. A coagulated film is formed, which, adhering, protects the villous surface beneath, during the passing of urine ; besides, the purely antiphlogistic effect of the remedy may be obtained, here, as in erythema ; and, not improbably, a third beneficial indication may be fulfilled—the virus may be chemically acted on and neutralized. Such injection is made once or twice ; and strict rest, with antiphlogistic regimen, is observed. The action may be arrested, resolution may rapidly follow, the virus may be destroyed, and the disease may thus be cut short in its outset. Obviously, however, such treatment is applicable only to the very earliest stage—which is seldom brought under the cognizance of the surgeon ; in irritable habits it is not likely to succeed ; and, under even the most favourable circumstances, there is always a risk of failure, with consequent aggravation of the original disease.

Failing the ectrotic attempt—or, no opportunity having occurred for its practice—the acute or inflammatory stage is met by the ordinary antiphlogistic means. And it is well to remember, in reference to this, that the first attack of gonorrhœa is generally the most severe. Rest is enjoined ; but, for obvious reasons, this all-important indication is but seldom

fulfilled—and hence one cause of this affection often proving tedious and troublesome in its cure. Diet is low ; the part is fomented, and by a handkerchief or bandage it is suspended ; antimony is given in nauseating doses ; the bowels are gently moved ; drastic purging does harm, by irritating the rectum, and involving the urethra in sympathy ; leeches may be applied to the perineum ; and, if uneasy feelings pervade the hips, loins, and thighs, the hip-bath will be found useful. In extreme cases, it is sometimes necessary to abstract blood from the arm. To mitigate the ardor urinæ, bland fluids are drunk, abundantly ; as linseed tea, a solution of mucilage, &c. To render the urine less acrid, saline draughts are useful ; as, a scruple of bicarbonate of soda, with a drachm of Rochelle salt, dissolved in tepid water, and then mixed with soda water ; taken three or four times daily. Bland enemata are useful, in regulating the bowels ; and, in the case of a sympathizing prostate, they are of service as a fomentation or poultice to that part. The antimony is of use, not only as an antiphlogistic, but also as an antiaphrodisiac ; and this latter indication is to be assisted by a suitable moral treatment. Should painful erections occur, opiates are given, especially at bed-time ; a pill of opium, hyoscyamus, and camphor, is found to be very suitable ; repeated as circumstances may demand. Sometimes full doses of colchicum are found of service, in relieving chordee. The natural tendency to leech the affected part is not to be indulged ; the leech bites are likely to cause swelling, partly by ecchymosis, partly by œdema ; and such swelling tends to complication by phymosis or paraphymosis ; besides, the wounds are liable to be inoculated by the virus, and troublesome sores may be the consequence.

At this stage, ectrotic treatment is not to be thought of. We would not seek for a sudden suppression of discharge, were this in our power. If it do occur, it is an untoward event ; sure to be followed either by aggravation of the original disorder, or by implication of the prostate, bladder, or testicle, through metastasis. Strong injection, therefore, is not suitable. No doubt, it may temporarily arrest the discharge ; but only because such an exacerbation of the inflam-

matory process has taken place, as checks all secretion ; the pain, swelling, and redness are greater than before ; and the discharge soon reappears in increased quantity.

The inflammatory crisis having passed over, the sternness of the antiphlogistic treatment is gradually departed from. And certain remedies are given, which by experience are found to exert a specific influence on the urethra ; copaiba and cubebs ; the former the more suitable at first ; given in cautious doses, lest a deleterious amount of stimulus be imparted to the parts.

As the case becomes chronic, antiphlogistics are gradually abandoned. And, for the state of congestion which remains in the membrane, the direct application of gentle stimuli is found useful. Pressure may be applied, by a compress over the corpus spongiosum ; but this is found irksome, and difficult of management. The method of injection is preferable. A glass syringe, with blunt point, and long narrow nozzle, is employed ; by means of which—inserted fully into the urethra—certain application of the injected fluid may be made to the whole diseased surface. Backward extension to the bladder need not be apprehended, the natural collapsed condition of the canal being a sufficient obstacle to this. The fluid injected is at first weak, and its strength is gradually increased, according to circumstances. In nothing is there more room for variety. Some use an infusion of green tea, or other vegetable astringent. Sulphate of zinc is perhaps most commonly employed ; or the acetate of zinc ; or sulphate of copper ; or the salts of iron ; or the nitrate of silver ; or alum. A favourite injection is the acetate of zinc, with a proportion of opium. Water is made before injecting, so that the fluid may reach the membrane directly ; and, on withdrawing the syringe, the point of the penis is held erect for some time, so as to keep the fluid in contact with the affected part. The operation may be repeated three or four times in the day ; unless over-excitement ensue—when injection must be wholly discontinued for a time ; and when resumed, it must be very cautiously. As already stated, the strength of the injection is gradually increased ; and, if it seem to have lost its influence on the membrane, it is better to change to a different kind, than to increase the first to a strength at all formid-

able. In fact, the principle of stimulation is conducted as in the use of lotions to a weak sore on the surface of the body, (*Principles*, p. 228.) In obstinate cases, benefit may be derived from nitrate of silver rubbed on the perineum, so as to act as a smart counter-irritant.

In the truly chronic stage, large doses of cubebs may be given with advantage; regard always being had to the kidneys, lest over-stimulation occur there. And, sometimes, very rapid amendment may be obtained, by cubebs combined with copaiba in the form of a paste, given in wafer paper—an admirable remedy for the chronic cases, but much too stimulant for the early stage. These internal remedies may be employed along with injection. Or they may be alternated. But, in no case, should injection be long and continuously persevered with; as, thus, a discharge of the stimulant's own production may be maintained, keeping up a state of congestion in the membrane, delaying the cure, and rendering the occurrence of stricture very probable.

Sometimes the affection is chronic from the first; a passive congestion furnishing the discharge. This is liable to occur in patients of sluggish temperament, who have had many attacks of the disease. In such cases, antiphlogistics are never suitable; and the stimulant mode of treatment is adopted from the first.

The casualties of the disease are met as they occur. Chordee requires cool covering of the parts at night, a suitable moral treatment, and sedatives. The attack, when spasmodic, may be moderated by immersion of the organ in cold water. Hæmorrhage often requires no treatment, being regarded as a salutary occurrence, auxiliary in the treatment; if excessive, it may be restrained by the application of cold, or by pressure, as already described, (p. 480.) Edema is relieved by fomentation and poultices. Bubo requires fomentation and rest; the first acuteness over, the external application of iodine is likely to obtain resolution. Abscess threatening in the penis, or in the perineum, is opposed by increased and concentrated antiphlogistics; if matter have formed, an incision cannot be made too early for its evacuation. Affections of the prostate and bladder require their suitable treatment, already noticed. And it is well to avoid them, by doing nothing heroically, in

the way of injection, after the case is fairly established. With some, no doubt, strong injections are still in vogue, at an advanced period of the case. But, in our opinion, they are warrantable only at the very first, as already stated; and then should consist only of nitrate of silver—which alone seems capable of exerting a purely antiphlogistic influence on skin and mucous membrane. It is used in clap, as in inflammatory affection of the mucous membrane of the throat; it forms a protecting crust, allays irritability, and resolves the inflammatory action. The same strength of sulphate of zinc would prove merely stimulant, and would not fail to effect an aggravation. Gout and rheumatism are met by their peculiar treatment. And, obviously, it is important to remove the tendency to uric deposit as speedily as possible; otherwise the passing of this cannot fail to maintain, and perhaps to aggravate the urethral excitement.

Thus, according to the ordinary principles of surgery, would we treat gonorrhœa; and with a good hope of success; if the indications regarding regimen and rest be fully carried out—a difficulty in many cases, as already stated. But there is no disguising the fact, that not unfrequently the disease proves quite intractable; as if determined to run its own course, regardless of the means employed—unchecked, almost unmitigated and unmodified. In such cases, some peculiarity of constitution will often be discovered; scrofula, gout, or extreme irritability of system. And, for such difficulties, no rules of treatment can be laid down. Each must be met by what seems most suitable under the circumstances; always avoiding undue activity of practice; and preferring rather that the disease should run its own course, than that, by unfortunate interference, more serious affections of the prostate, bladder, testicle, or general system, should be induced.

Bougies are by some recommended; but we would move them altogether from gonorrhœa to gleet. Their use in the former affection is extremely apt to over-stimulate, causing reaccession of the disease. In gleet, they are very serviceable, by obviating any tendency to contraction in the urethra, and removing the congested state of the lining membrane; and sometimes it is useful, by means of a bougie, to

apply the citrine, or some other stimulant ointment, to the anterior part of the membrane.

After discharge has ceased, and the uneasy sensations have almost wholly disappeared, great care is still necessary on the part of the patient. The cure is not yet complete. A hearty meal, a debauch in wine, venereal indulgence, a long walk or ride, may reinduce the discharge and pain. Avoidance of all such re-exciting causes, therefore, must be scrupulously observed, until at least a week has elapsed.

As to the period when contagion ceases, opinions differ. Probably, the discharge is most virulent, when first displayed—as yet non-purulent in character. Perhaps, as the purulent character is declared, virulence may decrease, and soon disappear. Possibly, the creamy thick discharge may be not different, in any respect, from the ordinary product of simple inflammation. But such matters are, as yet, not fully removed from uncertainty; and it is well always to approach error on the safer side; holding, for practical purposes, that so long as there is discharge, there is at least a possibility of communicating infection thereby.

Sometimes, the eyes suffer by gonorrhœa; and one of two affections may occur. *Gonorrhœal Ophthalmia* includes Conjunctivitis and Iritis. Gonorrhœal Conjunctivitis, as formerly noticed, is usually the result of direct contagion; virulent gonorrhœal matter having been applied from a second party. The inflammatory process is rapid and intense; and the most active measures are necessary, to prevent serious structural change. Gonorrhœal Iritis, on the other hand, is a remote result of the virus within the patient himself; occurring as a secondary symptom; usually mild in its character, and demanding no severity of treatment. It most frequently occurs in those of a rheumatic habit; and is not unlikely to be associated with affections of the joints.

Secondary symptoms, of any kind, are rare. Sometimes, however, a febrile disturbance is followed by papular eruption; and *Gonorrhœal Lichen* is said to be established. This, too, is mild. Under ordinary anti-febrile measures, the precursory disorder soon yields; and the eruption will not resist simple and ordinary treatment. Like the primary affection, it is capable of self-cure; and may often be medicinally disre-

garded, accordingly. Mercury is never necessary. The virus of gonorrhœa is comparatively mild ; its seat would seem to be much more in the part than in the system ; and when the latter is involved, it is but slightly.

In some constitutions, there is an intolerance of copaiba ; its use being followed by the appearance of an eruption, of the nature of urticaria, preceded and accompanied by smart constitutional disturbance. Discontinuance of the remedy, and general antiphlogistics, are enough.

Gonorrhœa Præputialis, sometimes termed Spurious Gonorrhœa, but more correctly *Balanitis*, denotes a condition of the præputial membrane and investment of the glans, similar to that of the urethral lining in gonorrhœa. The disease may be an accession to gonorrhœa ; or it may occur independently of this, from the same cause. Or it may be altogether simple in its origin ; resulting from accumulation of acrid secretion, from retention of calculous matter, or from external injury. The part is red, swollen, partially abraded by superficial ulceration, and discharges a profuse puriform secretion. The prepuce is œdematous ; and there is more or less trouble in micturition. The treatment is simple. An ectrotic result by nitrate of silver is almost always in our power. The glans, having been exposed, is pencilled lightly over by nitrate of silver in substance, or, what is better, by a strong solution of it. Within four and twenty hours, the amount of inflammatory action, and the amount of secretion, will be found greatly diminished. And, very probably, another application will complete the cure. Of course, rest and antiphlogistic regimen are not neglected.

Warts are a frequent concomitant of the foregoing affection ; or they may form independently of it. They are usually clustered round the corona glandis, and on the frænum. The best method of removing them is, to take away the projecting portions by knife or scissors, and then to touch the stools with an escharotic ; usually, the nitrate of silver, firmly applied, proves sufficiently powerful. If cutting instruments be objected to, the acetic acid may be used, or a strong infusion of tormentilla officinalis.

A more genuine form of *Spurious Gonorrhœa* occurs, when, from some cause, other than the application of gonorrhœal

matter, an inflammatory process is kindled in the anterior part of the urethra, and furnishes discharge. The inflammatory process is common ; not specific. The symptoms are comparatively mild ; and their duration is short. The ordinary antiphlogistics suffice for cure. The more common exciting causes of such an affection, are ; the internal use of cantharides, or other irritants ; the application of acrid female secretions, in legal intercourse ; injury done by instruments, or by the passing of calculous fragments ; external injury of any kind ; sympathy with the rectum.

Gonorrhœa in the Female.

The female suffers comparatively little from Gonorrhœa. For a few days only, the acute symptoms persist ; and the chronic stage is attended with but little discomfort. The parts affected are, the urethra, as in the male, the vulva and exterior of the vagina, and the os uteri ; the last mentioned part frequently becoming affected by superficial ulceration. Sometimes, the inguinal glands enlarge sympathetically. The prominent symptoms are—the discharge, painful micturition, pain and swelling in the vulva, uneasiness in sitting and walking ; at first, some constitutional disturbance ; often, an aching in the back and loins. Treatment is simple. At the outset, an ectrotic result may be obtained ; the vulva being painted over by nitrate of silver. Failing this—during the short acute stage, recumbency, with antiphlogistic regimen, is enjoined ; the parts are diligently fomented ; and, if need be, demulcents are given freely. Afterwards, injections are to be used, of greater strength than in the male ; and a piece of lint, soaked in the stimulant solution, may be kept constantly retained in the vulva. The gallic acid may be useful, internally. And, ultimately, a tonic system of general treatment may be expedient.

Young girls are liable to suffer from a spurious gonorrhœa, caused by some intestinal, rectal, vesical, or general irritation ; and consisting of an excited, and perhaps excoriated state of the vulva and orifice of the vagina, with discharge. It yields readily to removal of the cause, followed by the simplest local treatment. A knowledge of its nature and

origin is obviously of much importance, in a medico-legal point of view.

The true gonorrhœa is apt to be confounded with Leucorrhœa ; but may generally be distinguished, by attention to the following circumstances. Leucorrhœa is chronic in its character, from the first appearance of discharge ; and is attended with pain in the back, lassitude, irregular menstruation, pallor, &c. In gonorrhœa, there is urethritis ; leucorrhœa is not so complicated. It is seldom, too, that in the latter affection, acute patchy ulceration is to be found affecting the os uteri.

Syphilis.

This includes, as a general term, all the diseased states, local and constitutional, primary and subsequent, which follow, and are caused by, the inoculation of a venereal poison. The action of poisons has already been considered, (*Principles*, p. 618 ;) as well as the probability that there is here a double process of zymosis. The virus, settling on and in the part, accumulates there, and at the same time excites an inflammatory process, soon ending in true inflammation ; and this, again, always causes suppuration and ulceration—sometimes sloughing. This constitutes the *Primary* or *Local symptoms*. From the specific sore, thus produced, absorption takes place, after the acute crisis of the inflammation has passed, (*Principles*, p. 95.) And, by absorption, the virus enters the system, through the circulation ; more or less rapidly, and in greater or less quantity. In the system, a second zymotic process is established ; the poison is multiplied ; and, acting perniciously on the frame, it declares itself by fever and eruption—these constituting the *Secondary* or *Constitutional symptoms*. By such an outbreak, the poison may be fully eliminated ; and, if so, then the disease is at an end. If, however, the elimination is incomplete, then other affections—of bone, skin, and mucous membrane—make their appearance at a still more remote date ; and these are termed *Tertiary symptoms*.

The venereal ulcers, or primary sores, are of different kinds ; and these different kinds are liable to be followed by corresponding variety in the secondary symptoms. Hence it has

been inferred, that there are varieties in the originating virus—that there is a plurality of poisons. This is not improbable. But, at present, the question is involved in much uncertainty. For practical purposes, it is sufficient for us to know, that all venereal sores are not alike in their characters, progress, and results ; that at least four different kinds exist, and can readily be discriminated ; and that each of these requires peculiarity of treatment.

But, in the first place, it is important to observe, that all sores of the penis are not venereal ; and, further, that all sores of the penis, caused by impure sexual intercourse, are not necessarily of this nature—the product of a specific virus. The penis is as liable, as other parts, to the ordinary causes of the common inflammatory process ; and common sores may result. Again, it is liable to be excoriated during coition ; and a sore may form in consequence, quite unconnected with the inoculation of any virus. And, also, the part is liable to herpetic eruptions, of quite a simple nature. *Herpes* of the penis usually occurs on the integuments of the body of the organ ; sometimes it forms on the præputial lining, behind the glans. It may be caused by the contact of acrid female secretions—not virulent ; or its accession may be altogether unconnected with sexual intercourse. It is known by the character of the vesicles, (p. 65) ; their plurality, form, speedy formation, and early disappearance. Rest, cooling medicine, and some simple soothing application, constitute the necessary treatment. Patients once affected by it are very liable to its recurrence. *Simple Abrasion* is known, by its immediate appearance ; by absence of the preliminary inflammatory process, and pustular formation ; by its superficial extent, and irregularity of form ; by the absence of true ulceration ; and by a speedy assumption of the healing process. It heals under the ordinary simple means. *Common sores* are known by the history of their production, and by absence of the characteristics of the venereal ulcer. If any doubt exist, it is expedient to treat the sore, locally, as if it were really venereal. Thus all risk, by mistake, is averted from the patient. And, if it be considered of importance to arrive at a certainty on the subject, the test by inoculation may be had recourse to. A portion of discharge from the sore is inserted, by the point of a lancet,

in the inside of the thigh; if the virus be present, a succession of results will occur as in the case of other inoculations; active congestion will form, then pustular formation, and then ulcer. By the third day, the characteristics will be sufficiently plain. And then, by freely rooting out the forming pustule by means of an escharotic, propagation of the disease is prevented.

I.—*The Simple Venereal Ulcer.*

If previous excoriation, or other breach of surface exist, the sore may declare itself at once; the incipient inflammatory process becoming apparent, almost immediately after connexion. More frequently, the virus has to find its way through entire skin or mucous membrane. And a day or two, consequently, may be occupied by a period of incubation—ranging from one to ten, or more.* Then the inflammatory process, causing pustular formation and ulcer, advances, as already stated; ulceration being generally established by the sixth day from the time of infection. The progress may be conveniently divided into three stages. *First*, that of inflammatory action and pustular formation. Redness forms, with itching and heat; in the centre of the redness, vesication takes place; the contents of the vesicle become purulent, constituting a pustule; this breaks, with or without scabbing, and discloses an acute ulcer beneath. The *second* period is that of ulceration; occupying, also, it may be said, from three to ten days. The advancing sore is of a circular or oval form; excavated; of pale surface; surrounded by a bright inflammatory areola; and furnishing a thin ichorous discharge. This is the period of infection, inoculation, and arrest by cauterization. The thin ichorous discharge, not yet truly purulent, is certainly most charged with the virus, and consequently most likely to propagate the disease by contagion. It is now that the most favourable opportunity exists for attempting the test by inoculation—if such be desired. And it is only at the early part of this period, that we have it in our power, by converting all

* There seems good reason to suppose, that in general the virus begins to act very soon after its application; within a few hours, in most cases; and that the examples of apparently protracted incubation depend, chiefly, on the circumstance of the poison having been temporarily intercepted, as it were, by a hair follicle, a hardened portion of cuticle, or other obstruction.

into an instant slough, to extirpate the disease while it is yet wholly local. The *third* stage is that of reparation ; the sore speedily showing the characters of the weak class. Tall, pale, and flabby granulations sprout up, above the level of the surrounding parts ; and the vascular areola diminishes, in both extent and intensity. In this state, the sore may remain stationary for many days. But, on the healing process being begun, a fourth stage may be said to be in progress ; that of cicatrization.

The negative signs by which this sore is distinguished, are : the absence of surrounding induration, no elevation of the edges, and no tendency to phagedæna. Its ordinary site is on the prepuce, and in the sulcus behind the corona glandis ; often by the side of the frænum ; occurring, in short, in the parts most susceptible of, and most exposed to contagion, and where the virus is most likely to nestle, overlooked.

All sores near the frænum are unfavourably situated. The second stage is of long duration, and the ulceration is acute ; the sore continues to enlarge ; often it burrows beneath the frænum, causing perforation ; and reparation seldom advances, until the frænum has been wholly destroyed. In all such cases, therefore, it is well to abbreviate the process, by division of the frænum ; care being taken that troublesome hæmorrhage do not ensue, from the small but active artery which generally shows itself at the time of incision.

In treatment, early application is of the greatest importance. For, it is only during the first few days, that we can be certain of success in the ectrotic attempt. Some authorities extend the favourable opportunity to the sixth day, from the first symptom of infection ; and some include the whole period of the second or ulcerative stage. All seem agreed, that, within the first three days from the first onset of the specific inflammatory process, it is certainly in our power to root out the disease ; converting the poisoned ulcer into a simple sore ; and preserving the system quite untainted. For this purpose, an escharotic is freely applied ; and, in general, the nitrate of silver is found sufficiently powerful—pointed, inserted accurately within the sore, and pressed there firmly ; the fluid exudation being wiped up, as it threatens to overflow. Water-dressing is applied, until the eschar sepa-

rates ; and then the surface beneath is anxiously scanned. If it present all the characters of a simple and healthy sore, the water-dressing is continued, and healing advances. If, however, the tawny surface and angry appearance of a still virulent ulcer show themselves, the nitrate is re-applied. And such repetition is carried out, from time to time, until a satisfactory clearing has been obtained. If profuse and offensive discharge exist, it may be well to medicate the water-dressing, from the first, by one or other of the chlorides ; the foetor will thus be corrected ; and the nitrate of silver will also be assisted in decomposition of the virus. If the sore seem at the first unusually obstinate as well as large, it is well to begin with a more powerful escharotic ; the potass, nitric acid, or fluid nitrate of mercury.

The healing process having begun, simple water-dressing may not be long continued ; for, sores on the penis, of a simple nature, tend speedily to the characters of the weak sore. Early medication, by zinc or otherwise, is accordingly required. If, notwithstanding, the granulations threaten exuberance, there is no better plan than to touch the elevated surface, every second day, with the nitrate of silver, lightly ; applying water-dressing intermediately. During the treatment, rest is of the greatest importance ; and the organ should also be suspended, by a handkerchief or bandage.

If the case be seen too late to admit of the ectrotic treatment, the sore being in the third or reparative stage, the application of nitrate of silver is still useful ; by subduing the exuberant granulations, and expediting the healing process. We cannot now save the system from contamination ; absorption having already been busy. But we may diminish the amount of taint, by shortening the period during which absorption takes place ; and, besides, the nitrate probably acts decomposingly on the remaining local virus. Experience tells us, that the more speedily the sore is healed, the less is the likelihood of the occurrence of secondary symptoms.

Warts are not an unfrequent complication. They are subject to the same treatment, and are of the same nature, as those which attend on gonorrhœa.

The secondary symptoms which occur, at a period of from

three to six weeks after infection,—if the ectrotic attempt have failed, or have not been practised,—may be either exanthematous or papular ; venereal roseola, or venereal lichen. The eruption is preceded by fever, and is accompanied by an affection of the throat, similar to what attends other eruptions of the same class. The tonsils, and fauces in general, are red, raw, swollen, and painful ; sometimes invested by an aphthous coating ; sometimes superficially abraded. The eruption is chiefly situated on the trunk, more especially on the back and belly ; but the face and limbs are not exempt. Sometimes there is mere discolouration of the skin, in numerous faint spots.

A patient having begun to complain, at the ordinary time of accession, of such symptoms of general disorder as usually usher in the secondary symptoms, it is our object to favour an early and full appearance of the eruption ; for, thus the febrile condition will be relieved, and what seems the natural effort towards extrusion of the poison from the system will be assisted. To check the skin affection, were as unwise as to attempt repression of the eruptions of measles, small-pox, or scarlatina. The bowels are gently acted on, and a warm bath is given. Regimen is antiphlogistic, and confinement to the house is enjoined. Antimony is given, with more than one object in view ; it tends to moderate fever, at the same time determining to the skin ; and there is good reason to believe, that it is an auxiliary of no mean power in elimination of the virus. The eruption, having attained its acmé, gradually fades. At the same time, the affection of the throat recedes ; but, in general, amendment here may be expedited by use of the nitrate of silver. By warm-bathing, restriction of diet, avoidance of exposure, and general attention to the skin—iodide of potassium, sarsaparilla, or other alteratives, being given if necessary—purity of the surface is restored ; and the cure is complete. It is very seldom that the more decided, but more dangerous alterative, mercury, requires to be had recourse to. Its sparing exhibition—only as an alterative—is expedient, however, when the eruption either proves obstinate in its first attack, or tends to sundry recurrences, under the ordinary treatment. Tertiary symptoms need not be dreaded.

II.—*The Ulcer with elevated edges.*

In this—a compound of the Irritable and Inflamed sores, of the general surface—the reparative stage is late; not occurring until at least two or three weeks have elapsed. The excavated surface is of a brownish hue; and the edges are elevated, not only above this raw surface, but also above the surrounding parts. There is no surrounding induration, and there is no phagedæna; but, sometimes, the ulceration is acute and rapid; destroying the parts, by persistence of the acute inflammatory action, almost as formidably as if by phagedæna—more especially if the sore be situated near the frænum. The treatment is the same as for the former class of sore. But, if the healing process be obstinately deferred—in cases too late for ectrotic treatment—a small quantity of mercury may be cautiously administered; a blue pill being given, night and morning, until the characters of the sore show amendment. Even this cautious dose, however, is not expedient, until the more simple and safe means have been fairly tried, and have proved ineffectual.

The partially Irritable, is liable to pass into the thoroughly Inflamed sore, here as elsewhere. In such circumstances, all escharotic or otherwise irritant applications must be abstained from, until, by the ordinary means, inordinate inflammatory action has been subdued. In the irritable condition, the oxide of silver is sometimes of use, in the form of ointment.

If the ectrotic attempt have failed, the occurrence of secondary symptoms is extremely probable. The antecedent febrile disturbance is usually more considerable than in the first class of cases; and the eruption is of either the papular or the pustular character—more frequently of the latter. The pustules are chiefly situated on the chest, back, and face; occasionally they degenerate into irritable sores; but the majority fade, and heal by incrustation. Their site is marked by brownish discolouration, sometimes of obstinate persistence. Bubo is not unlikely to occur, more especially if the patient fail to observe recumbency; the lymphatic enlargement not, in general, dependent on a common inflam-

matory process, excited by simple irritation on the penis—as in the case of gonorrhœa, or simple abrasion, or herpes—but on a specific inflammatory process, caused by propagation of the virus from the original site, and lodgment of it in the ganglia. Iritis, too, may occur, constituting a serious complication. Affection of the throat is tolerably severe; and the tonsils may display extensive aphthous ulceration.

The secondary eruptions require the same general treatment, as those which follow the first class of sore. Bubo is treated by rest, fomentation, &c.—perhaps by leeching. Iritis demands its own peculiar management, formerly detailed; and its demand must be complied with. Only in the slightest forms, dare mercury be withheld. Its exhibition here is not antisymphilitic, but antiphlogistic; and it is managed accordingly. The throat requires soothing by inhalation, in the first instance; afterwards, the nitrate of silver, in substance or in strong solution, applied every second day, will remove the irritability in the breach of surface, and expedite cicatrization. If either the throat or the skin affection prove obstinate; or if, after deceptive disappearance, re-accession occurs;—mercury may be given—sparingly; rather, however, as a last resource, than as an ordinary part of the treatment. Antimony and the iodide of potassium, with attention to hygiene, prove sufficient in the greater number of cases.

A troublesome sore sometimes forms on the orifice of the urethra; and it generally is of this class. Constantly exposed to irritation, by the passing of urine, it is slow to heal; it may, by persistence of ulceration, cause considerable loss of substance; and then cicatrization cannot occur, without producing more or less contraction of the urethra at that part. Hence, it is obviously of great importance to detect its presence early, and to make sure of the ectrotic use of the nitrate of silver. During the subsequent healing, light application of the nitrate is very suitable; this forming an adherent incrustation, protective of the parts beneath. And this protection may be further aided, by the temporary application of an oiled piece of lint, on each margin of the orifice, during micturition.

Sores sometimes form more within the urethra; causing much trouble, by pain, swelling, discharge, and liability to

constitutional sequelæ ; and rendering the occurrence of troublesome stricture all but inevitable. They are treated by injections, carefully introduced so as to ensure their application to the sore ; and of such a kind as would be applied to the ulcer in an ordinary site. After cicatrization, the occasional use of a bougie is expedient, to obviate the tendency to undue contraction.

III.—*The Hunterian, or True Chancre.*

This belongs to the Indolent class of sores ; but, unlike those on the general surface of the body, is indurated from the first. The antecedent inflammatory process is chronic, accompanied from the first by copious plastic exudation, around and beneath the forming sore ; giving an almost cartilaginous hardness to its base and margin. The sore is circular, and much excavated ; the surface, of a tawny or brownish hue, seems as if recently scooped out by an instrument ; reparative action is faint, and long-delayed ; sometimes, the site of granulation is occupied by a thin, ash-coloured, adherent pellicle. There is no surrounding vascular areola, after the sore has fairly formed. The ordinary sites are, the glans penis, and the integument of the body of the organ ; the former the more frequent, and showing the greater induration. While other kinds of sore may occur in one or two places, this form is in general solitary.

Treatment is based on the same principles as that of the preceding varieties. But the nitrate of silver will be found too feeble an escharotic. Not only the sore, but also the callous induration around and beneath—in which, it is probable, the virus mainly resides—must be destroyed ; and, for this purpose, the potassa fusa is necessary—freely applied, perhaps with repetition. Neither is it enough, merely to obtain cicatrization, leaving the hardened base and margin but little altered, if at all. These, constituting the essential parts of the disease, must be got rid of. If, after repeated use of the escharotic, hardness still remain, then removal by discussion is to be attempted ; by internal means—mercury, or the iodide of potassium ; and also by the local application of these substances. It is better that some further contamination of the

system, by rapid and final absorption, should be risked, than that the part should be permitted to remain a constant zymotic source of propagation.

It may happen, that early and free use of the potass thoroughly succeeds in obtaining the ectrotic result ; the sore completely changing its character, and healing up, without risk of secondary symptoms. More frequently, however, we fail in this ; probably from being too late in our interference ; and the sore refuses to change under local means alone. Then mercury is necessary ; given with more freedom than in any of the former cases, though still with caution ; never pushing it to thorough ptyalism, and always ceasing from the administration, at least for a time, so soon as amendment seems fairly begun in the sore. It is invariably our object, to accomplish the desired end, at as little cost of the mineral as possible.

When the ectrotic attempt fails, as is not unlikely, secondary symptoms are almost certain to occur. The eruption is scarcely preceded by fever, and is unaccompanied by it. Faint, brownish spots, or maculæ, appear—chiefly on the trunk ; or, as more frequently happens, an eruption of copper-coloured blotches occurs, and these subsequently become scaly—evincing the characters either of lepra or of psoriasis. As the primary sore is considered the true *Chancre*, so the constitutional affection may be termed the true *Syphilis* or *Pox*. The throat is involved ; but, as in the other symptoms, this shows but a sparing amount of inflammatory action. One or both tonsils are found occupied by deep ulceration ; often there is a sore on each, of characters very similar to those of the primary ulcer. For such affections of the system, there is no remedy equal to mercury ; and it seems generally agreed, that, when the true syphilis has declared itself, the cautious use of that mineral should be immediately begun. No heroic dosings are necessary, however ; an alterative course is still all that is required ; continued till amendment appear ; and perhaps revived, at intervals, until a final clearance of the poison has been effected. Bubo, and iritis, if they occur, are met by their appropriate treatment ; in the latter affection, the mercurialization may be conducted with especial freedom—for a marked tolerance of the remedy will certainly be found.

If the primary and secondary symptoms have not been actively and conclusively dealt with, tertiary symptoms are extremely probable; showing themselves after the lapse of some months. The periosteum of the bones which are most exposed—tibiæ, ulnæ, clavicles, cranium, sternum—suffers by a chronic inflammatory process; and the bones themselves are similarly involved; creating the condition of Node, sometimes circumscribed and acute, more frequently chronic and diffuse. The joints, too, are affected, with chronic swelling and pain. Fœtid, ill-conditioned sores may form between the toes. Condylomata may appear on the nates and perineum. Irritable sores may form on various parts of the general surface. The throat may again become attacked by ulceration—of a more diffuse and acute character; the palate may be involved, and exfoliation may ensue. And one or both groins may be occupied by indolent bubo. The more ordinary of the tertiary symptoms, however, when mercury has not been abused, are the ostitic and periostitic affections. And, for these, as well as for the tertiary symptoms in general, the iodide of potassium is found to be by much the preferable remedy; begun in full doses, and regulated according to the effects produced. Eight grains, thrice daily, in solution, is a justly favourite form of exhibition.

There is a modification of this class of sore, which consists of induration merely. A callosity forms, after impure intercourse; and it may, or may not, ulcerate, at a late period. It is equally prone to contaminate the system, as the true chancre; and requires precisely similar treatment. Cure is not complete, so long as any degree of hardness remains.

IV.—*The Phagedænic Ulcer, the Sloughing Ulcer, and the Sloughing Phagedæna.*

Phagedæna, here, as elsewhere, may be either acute or chronic. The latter is not very formidable; being, as it were, only a degree more destructive than the worst forms of the second class of sore. Its most common site is the root of the glans; but, not unfrequently, it burrows from this, beneath the fascia of the penis, producing much induration and swelling of the organ, with copious fœtid discharge; advanc-

ing unseen and unchecked, till much mischief is done ; perhaps opening into the urethra, at one or more points ; at all events, laying the foundation of tedious sinus, with perhaps a permanently enfeebled and anormal state of the organ. Sometimes, also, this form of sore attacks the posterior part of the dorsum of the penis, and burrows beneath the pubes.

Acute phagedæna, the sloughing sore, and the sloughing phagedæna, present the same characters here, as elsewhere ; (*Principles*, p. 242,) attacking the glans and prepuce, indiscriminately ; and, in a short time, effecting the most destructive ravages thereon. The accession and progress of the sore, or sores, are accompanied with marked constitutional disturbance, of the nature of irritative fever, tending manifestly to prostration. The sinister characters may declare themselves from the first ; or, for a day or two, the sore may seem but an unusually foul and active sample of the second class, attended with an unusual amount of constitutional disturbance ; and then, without any apparent exciting cause, rapid aggravation takes place, in both the local and the constitutional symptoms ; constituting what is ordinarily termed the "black pox." Sometimes, such aggravation would seem to be accelerated, if not caused, by an imprudent administration of mercury. And, sometimes, mercurialism would seem to have the effect of converting an originally simple sore, of the first or second class, into a tolerably close imitation of this of the fourth. It is important, however, to discriminate between the sore originally of a bad kind, and that which, by casualty, has become temporarily occupied by a slough, from over-action ; for, the suitable treatment is very different. Active and painful local treatment is required in the one ; rest, and simple antiphlogistics, are sufficient for the other. As the disease advances, the constitutional disturbance increases proportionally ; and this, becoming decidedly typhoid, may prove fatal. Or it may be assisted by hæmorrhage. Moderate loss of blood, however, may have an opposite effect, in the less urgent cases ; occurring in quantity sufficient to affect the part, resolutely ; and not to such an extent as to affect the system, depressingly. In most cases, a fatal result may be avoided ; but, in many, serious mutilation is inevitable. The disease, fortunately, is comparatively rare ; and is chiefly

found in maritime towns, where, by sailors and the lower class of prostitutes, sexual dissipation is extravagantly perpetrated.*

To change the character of the chronic phagedæna, no local application is so powerful as the fluid nitrate of mercury ; diluted, so as to have an alterative, rather than an escharotic effect. The primæ viæ are attended to ; the regimen is antiphlogistic ; warm bathing is useful ; and strict rest is enjoined. The acute phagedæna, the sloughing phagedæna, and the sloughing sore, require the active treatment, locally and generally, suitable to this form of disease, (*Principles*, p. 245 ;) the clearing out of the primæ viæ, followed by sedatives and anodynes ; the stern use of an active escharotic, the characteristic moisture of the sore having first been removed ; strict rest, and an antiphlogistic regimen ; but, at the same time, a careful watching of the constitutional symptoms, lest typhoid tendency suddenly supervene, and stimulants become indispensable. Cover the part in a poultice, and treat the case expectantly, as is the manner of some ; and a melancholy mutilation will be the probable result.

In the outset of an urgent case, one is tempted to imitate nature, and abstract blood. But, generally speaking, the experiment is a rash one ; it may irreparably depress the system. While, however, bleeding from the system is unwarrantable, abstraction may sometimes be made from the part, safely and well. A pendulous, half-dead portion of prepuce, soon about to slough wholly, may be cut off by the stroke of a bistoury ; and the bleeding from the wound may be encouraged, to such an extent as may be deemed suitable and safe. Sometimes paraphymosis occurs ; as can be readily understood, on account of the swollen state of the parts. This must be instantly remedied by replacement, if possible ; if not, a free, liberating incision must be made on the dorsum of the penis,

* "Most of the young creatures who are brought from that genteel place, Swan-alley, afflicted with phagedænic ulceration, have had very little wholesome food ; they are generally kept by Jews and Jewesses, who give them plenty of gin, though but little proper nourishment ; they are half-starved, and, more or less, in a continued state of excitement and intoxication, having connexion with lascars, and other dirty foreign seamen, as many times in the day as there are hours. In this manner, their constitutions must soon get into a very disadvantageous state for the favourable progress of any disease whatever ; and we cannot wonder that their impaired, and imperfectly developed frames, their course of life, and uncleanness, should promote phagedænic ulceration, and give it an unusually severe character."—S. COOPER.

at the constricted part ; otherwise, the progress of destruction cannot fail to be frightfully aggravated. After cicatrization has been completed, it is sometimes in our power partially to remedy the damage inflicted, by closing the anormal apertures in the urethra by means of autoplasty.

Mercury is never advisable. Persistence of the febrile disturbance, is itself a sufficient contra-indication. Besides, experience plainly tells us, that its local effect is to accelerate the sloughing and phagedæna ; seeming to favour the softening and undoing of organized structure, and so fitting it either for absorption or ulceration, while the latter tendency is already excessive.

Obviously, in such cases, an ectrotic treatment is scarcely within our power. The local disease spreads too rapidly to permit isolation of the virus, with extirpation of the affected part ; and, consequently, the occurrence of secondary symptoms is generally to be expected. Their accession is preceded by serious constitutional disturbance, similar to what attended on the local symptoms, but generally less urgent. The eruption may be pustular ; the pustules large rather than numerous, giving way, crusting, and degenerating into foul sores, of either the inflamed or the irritable characters. Or, it may be vesicular ; large flat bullæ forming, with contents at first serous, but afterwards purulent ; giving way, crusting, and forming unhealthy sores beneath. Or it may be tubercular ; broad tubercles forming, which enlarge and suppurate slowly, ultimately degenerating into loathsome and extensive sores. The throat is the seat of asthenic inflammatory action ; ulceration quickly forms, and spreads both in width and depth—by sloughing, by phagedæna, or by both. In some cases, one or other of the large vessels in the neighbourhood of the tonsil have been opened into, and fatal hæmorrhage has ensued. The larynx may be involved ; ulceration actually extending to it ; or œdema, preceding the ulceration, and causing most urgent symptoms. Either event may prove fatal. Bubo is seldom absent, at some period of the case. And when, by suppuration, an opening has taken place, this is apt to assume the same characters as the primary sore ; by this time, probably, the gland being itself the residence of the same poison—by absorption and zymosis.

The treatment of these symptoms is fraught with much anxiety. Still mercury is withheld. It would but aggravate. Regimen is antiphlogistic; and antimony is given guardedly—so as not to prostrate; in many cases, it is well to combine it with gentle opiates. Warm-bathing is grateful, and may relieve the febrile disturbance. Evacuants are obviously calculated to be of service; acting on skin, bowels, and kidneys; yet still not so as to cause prostration. The sores on the surface are cleaned and calmed, by poultice or water-dressing; afterwards they are dressed with nitrate of silver, or other lotion. The fauces are diligently fomented by inhalation; the sores are touched with nitrate of silver in substance, or with the fluid nitrate of mercury, slightly diluted; and, after the acute stage has passed, benefit will accrue from moderate counter-irritation. Then diet is gradually amended; and, when all has passed into the chronic stage, much advantage may result from judicious use of the iodide of potassium. Should iritis occur, a serious difficulty is engendered. We wish to give mercury, to save the eye; and we at the same time wish to withhold it, to save the constitution. At first we trust, therefore, to smart loss of blood from the neighbourhood of the part, and to the substitution of turpentine for mercury as the specific internal remedy. Only after this has failed, are we driven to a cautious use of the dangerous mineral.

The tertiary symptoms which may follow this form of primary and secondary disease, are of a formidable character; more especially, if mercury have been given. Bones are liable to osteitis, and its highest results; abscess, ulcer, caries, necrosis. Tubercles form on the skin, larger, more painful, and degenerating into worse sores than those of the secondary class; often crusting prominently, and assuming the characters of *Rupia*. The throat is liable to be again attacked; in a more chronic, but very obstinate ulceration; with the same risk by hæmorrhage; and with the additional risk of ghastly deformity, by involvement of the hard tissues in the palate and nose. It is in this form, associated with a strumous tendency of system, and maltreated by the false mineral specific, that deformity and death are most likely to occur. But, happily, both of these untoward events are now-a-days rare. Modern treatment does not aggravate, if it fail to cure. It

consists in ordinary attention to the general functions, with careful regimen—not low but temperate; and in the administration of sarsaparilla, guaiac, or other simple alteratives, so long as febrile excitement, or stomachic and intestinal derangement, may remain. The primæ viæ having rallied, and febrile disorder having ceased, then the iodide of potassium is brought into play, internally; and is patiently persevered with—hygiene, meanwhile, being not neglected. In obstinate cases, the “liquor hydriodatis arsenici et hydrargyri” may be of service.

Condyloma.

Condylomata are excrescences of the integument; sometimes white, sometimes of a mucous appearance; sometimes dry, sometimes exhaling a thin discharge; forming on the nates, around the anus, in the folds of the thighs, on the perineum, on the scrotum—in the female on the labia. They occupy a doubtful place in the arrangement of primary, secondary, and tertiary symptoms. And there seems little doubt, that they are to be found, in practice, pertaining to all the three classes. Discharge trickling from primary sores—more especially from the true chancre—and accumulating filthily in the neighbouring folds of integument, doubtless produces such irritation, and probably inoculation, as may lead to the condylomatous formation; and this may then be regarded, as partly of a secondary and partly of a primary character. Condylomata may also show themselves along with ordinary secondary symptoms; though this is rare. Again—months after the primary attack, and after a secondary train of symptoms, too, have run their course—condylomata may appear, for the first time, among the tertiary symptoms; and this is most frequently observed after true chancre. And there is no reason to doubt, that, not unfrequently, condyloma forms as the primary and only form of infection; whether communicated by a distinct variety of poison, or not, we are not at present in a position to determine. To the primary condyloma, a peculiar kind of constitutional affection succeeds. An “exanthematous eruption of a mottled appearance, and of a red or brownish colour, occurs; sometimes pre-

ceded by vesication or scaliness, but never by pustules ; sometimes elevated," and approaching to the tubercular character. The throat is raw and painful ; and, on the mucous surface of the lips, cheeks, palatine arches, and tonsils, " peculiar, white, elevated patches are found ; having the appearance of parts touched with the nitrate of silver, or coated with milk ; irregular in form, and presenting occasionally superficial ulcerations on their surface." By some it is supposed, that this affection is identical with "sibbens;" which at one time used to prevail much in this country.

The treatment of Condyloma consists in repeated applications of sulphate of copper, nitrate of silver, or more active escharotics, until the excrescences disappear ; in rectification of the primæ viæ ; and in the internal use of the iodide of potassium. The affection of the throat and mouth is treated with the nitrate of silver, in substance or solution, applied every second day. The internal remedies—it is to be understood—are required only for the constitutional symptoms. Primary condyloma is removable by local treatment—perhaps ectrotic—in the same way as any primary sore.

Bubo.

Bubo, like Condyloma, is with difficulty appropriated to a class ; for it, too, may be found of primary, secondary, and tertiary occurrence. It is a question, whether or not bubo may be truly a primary form of syphilis ; occurring without the formation of sores, of any kind, on any part of the penis ; capable of producing venereal sores, by inoculation of the matter which forms by its earliest suppuration ; and liable to be followed by constitutional pox. The probability is, that occasionally bubo is thus "*d'emblée*;" but that, in the great majority of cases, it is a result, more or less remote, of venereal ulcer ; the consequence, sometimes, of simple extension of the inflammatory process along the lymphatics ; more frequently arising from angeioleucitis, not only induced but maintained by the virus—which may become not only resident but accumulated, by zymosis, within the affected glands. In gonorrhœa, the sympathetic bubo is probably the consequence of simple excitement. Inguinal swelling may, indeed, precede

the appearance of discharge ; the very first part of the inflammatory process having proved a sufficient stimulus to the lymphatics.

True bubo, as it may be termed, is the product of virus proceeding from a venereal sore ; and usually occurs after the ulcerative stage of the sore has ceased, when absorption is busily resumed. But at any period bubo may occur, through exercise, debauchery in drink, or other folly on the part of the patient ; occasioned then—if at an early period—by mere extension of the inflammatory process ; at a remote period, partly by this, and partly by evil working of the absorbed poison.

Bubo of the Penis is said to exist, when the lymphatics on the dorsum are continuously affected by inflammatory action ; and when—usually about the middle of the organ—painful swelling takes place, with much induration ; the inflammatory process having thrown out a large amount of plastic deposit, and threatening to advance to central suppuration. Pus generally forms ; and may either be at once evacuated externally, or may burrow extensively beneath the fascia. The treatment is by rest, leeching, and fomentation, in the acute cases. The subacute swelling may be discussed, by external application of the iodide of potassium in solution. When suppuration has taken place, early evacuation is practised ; more especially if retention of urine have threatened to occur, (p. 487.)

Inguinal Bubo affects the upper cluster of glands ; and this is a prominent characteristic of the venereal affection, in contra-distinction to inguinal enlargement in consequence of sores, or other source of irritation, on the thigh, leg, or toes ; in which latter case, the swelling will be found beneath Poupart's ligament. The tumour may be small or great ; chronic, subacute, or acute ; indolent, or hastening to suppuration. The acute varieties, prone to suppurate, are those which follow directly on the primary sore ; the chronic and indolent range themselves rather with the secondary and tertiary symptoms ; the acute form often affects but one ganglion ; the chronic frequently implicates the whole cluster ; in suppuration of the acute, matter generally is first formed in the cellular tissue exterior to the gland ; if the chronic slowly come

to matter, gradual softening and suppuration take place in the interior, and may originate at more points than one. To such swellings, the ordinary principles of surgery are applied; not always, however, with the ordinary result. Were the acute bubo dependent on simple excitement, or on mere extension of a simple inflammatory process, it would doubtless often yield satisfactorily to rest, leeching, and fomentation. But such is not the case; leeching is found to have but little effect in retarding the onward progress; and this is to be explained, by the active presence of venereal virus within the part itself—just as antiphlogistics would have but little effect, in retarding the formation of the primary pustule and sore. Loss of blood, therefore, may in most cases be abstained from; rest, fomentation, poultice, and antimonialization are employed; and, when matter forms, it is evacuated. And perhaps it is well that suppuration and evacuation should occur; there being a tendency thereby towards elimination of virus. Should matter form only between the enlarged gland and the skin, it is well to ensure suppuration of the former, by penetrating its interior by potass introduced through the external wound—after the acute stage is over; otherwise, the cure will be tedious and imperfect, and, obviously, little or nothing will be done towards elimination. Under subsequent poultice and water-dressing, the swelling may only partially subside; in such circumstances, discussion of the indolent tumour is to be obtained, by the application of pressure by means of a compress and bandage. Sometimes matter is secreted at different times, and in different sites; and, in consequence, sinuses are very apt to form. Then, a sufficient opening is afforded to each collection, and pressure is applied; if this fail, the sinuses are to be laid open by the bistoury. Very frequently, however, pressure, good diet, and the iodide of potassium internally, suffice. If, along with bubo, the primary sores still exist, it is obviously an indispensable duty to be very attentive in soothing these, and in obtaining cicatrization as soon as possible. An open bubo, attacked by sloughing or phagedæna, receives the ordinary treatment applicable to such a state.

The subacute bubo may be discussed; by rest, low diet, and the external use of the iodide of potassium, followed by gra-

dually increased pressure. Or, if this fail, a blister may be applied, in the hope of thereby either promoting resolution, or accelerating a satisfactory suppuration.

The indolent bubo may almost always be discussed; by pressure or blistering,—the former usually preferable—rest, good diet, and the internal use of the iodide. If an undoubted connexion exist with the third class of sore, a powerful alterative is necessary; mercury, in moderate doses. If matter form, it does so slowly and imperfectly; and blistering may be useful, in hastening the general disorganization of the swelling which is then desirable. Often, to complete this, the free use of potass is necessary; destroying undermined integument, and breaking up obstinate indurations of the glands.

Special modes of treatment have been thought advisable in venereal bubo; as, for example, by the local use of corrosive sublimate, and severe pressure. The preponderating weight of authority, however, would seem to be in favour of no departure from the ordinary rules of simple surgery.

In taking a general view of the subject of Venereal Disease, it is obviously resolvable into two great divisions—Local and Constitutional Pox.

I. *Local or Primary Syphilis*.—This consists of some variety of sore; sometimes of condyloma. It is transmissible to a second party, by contact and by inoculation; chiefly, if not only, during the ulcerative stage—in the case of a sore; and the earlier the secretion, the more impregnated is it, probably, with the virus. In treatment, an ectrotic result is to be obtained, by a timeous and decided use of an escharotic; which, converting all the poisoned textures into an instant slough, removes the disease—yet local and circumscribed; at the same time, probably, acting destructively, as a chemical, on the poison. Afterwards, the management of the sore is simple; by medicated water-dressing. If, however, the sore be found in an advanced state, acutely inflamed, red, swollen, and very painful, perhaps with affection of the lymphatics in the penis and groin, escharotics must be withheld. The inflammatory action is to be subdued by the ordinary means; and, meanwhile, something may be done towards decomposing and limit-

ing the poison, by the use of solutions of the chlorides. When ectrotics fail, mercury is given—alteratively—in addition to the ordinary local treatment; in the third class of sore, and in obstinate samples of the second. During the local treatment of all cases in which ectrosis fails, it is well to stimulate the organs of excretion; by attending to the bowels, promoting the flow of urine by diluents and gentle diuretics, and determining to the skin. Antimony is most useful with this view; the object of such treatment being, to favour elimination of the virus, by exaltation of ordinary means; in the hope, that it may be excreted from the system, as fast as it is conveyed thither by absorption from the primary affection; and that thus the systemic zymosis may be prevented.

II. *Constitutional Syphilis* consists of secondary and tertiary symptoms. 1. Those which follow speedily after the primary affection, within a few weeks at the utmost; usually during the second month; consisting chiefly of general eruption, and affection of the throat; ushered in by febrile excitement, and, generally, by more or less change in the complexion, dryness of the hair, rheumatic pains in the extremities of the long bones, and violent nervous headach, particularly in the forehead. 2. Those which occur more remotely, after six months or more have elapsed, and after the secondary train has already run its course; their most prominent and characteristic part being, affections of the skeleton, and of the superficial cellular tissue.

1. The *Secondary* eruptions are of different kinds. Exanthematous; roseola; following the simple sore, often at an early period. Not unfrequently it precedes the appearance of other forms of eruption; seeming to be the basis on which they subsequently form. Papular; lichen; the ordinary result of the first class of sore. Pustular; ecthyma; more frequently following the second class of sore than any other. Tubercular; prone to ulcerate untowardly; following the fourth class of sores. Vesicular; rare; large bullæ, surrounded by a copper-coloured areola; becoming purulent, crusting, and tending to *Rupia prominens*; sometimes following the second, but more frequently found after the fourth than after any other class of sore. Scaly; lepra or psoriasis; the result of the third class of sore; true syphilis. Sometimes condylomata

form, contemporaneously with the eruption. Such is the general arrangement ; but, in practice, an occasional confusion of the sequences need not excite surprise. Very frequently, the hair loosens, and comes away ; threatening baldness. The throat is variously affected ; by inflammatory process, aphthæ, or ulcer. Iritis not unfrequently occurs ; and may follow any form of sore ; it is more frequently found associated with the papular eruption, however, than with any other. Sometimes periostitis shows itself, on one or both shins.

A question here arises ; are sores on the penis ever of a secondary character ? No doubt, they are. Eruptions degenerate into sores, very frequently, on the general surface ; and there is no reason why the penis should be exempt from the general liability. Secondary sores there are known by their history ; appearing at a long date after exposure to contagion. And they are also distinguished by absence of the ordinary characteristics of primary sores ; usually superficial, inflamed, and of a tawny hue ; resembling the apthous ulceration of a mucous surface.

Secondary symptoms are shown, by experience, to be transmissible from husband to wife, from wife to child, from child to nurse ; the blood being tainted with the virus, multiplied by general zymosis ; and the virus being communicated through the medium of tainted secretion. As yet, it is very doubtful, whether they are communicable by direct contact or inoculation. It has still to be shown that the early, ichorous, non-purulent secretion of a secondary sore has not the power of propagating the disease. Probability certainly leans towards the affirmative of the question.

In the papular form of eruption, and in most cases of the pustular, mercury is seldom necessary ; in the tubercular, it is inexpedient. Antimony, sarsaparilla, guaiac, and the iodide of potassium, are powerful enough alteratives and eliminators ; and, along with attention to the general health, suffice for cure. In the scaly form, mercury is always given ; yet warily ; never pushed to extreme ptyalism ; and always ceased from, at least for a time, on amendment being begun. In the constitutional symptoms following on the sloughing sore, the phagedænic sore, or the sloughing phagedæna, mercury is studiously abstained from ; experience has amply demon-

strated its inefficiency as a means of cure, and the certainty with which it tends to ultimate aggravation. It is never our object to repress the eruption in its first onset ; on the contrary, its full appearance is solicited ; obstinate persistence, and repeated recurrence, however, we seek to overcome. And the object of our constitutional treatment is, simply to assist Nature in a full, early, and complete elimination of the poison ; by acting on the skin, kidneys, bowels, and other organs of excretion. The throat is steamed, fomented, touched with nitrate of silver, or blistered externally ; according as it is the seat of active congestion, inflammation, ulcer, chronic inflammatory action, or passive congestion. Iritis has its own appropriate treatment, except when the sequel of the fourth class of primary disease ; and then mercury is withheld, if possible—turpentine being substituted. Coming baldness is anticipated, by shaving the head ; and it is well to keep it closely shaved, for months, long after the other signs of constitutional disorder have wholly disappeared.

2. The *Tertiary* symptoms seldom occur, except after the third and fourth classes of sores ; unless when mercury has been profusely and rashly administered. In any case, they are seldom urgent, when the result of the venereal poison alone. It is only when this has been associated in the system with the mercurial poison, that severity is declared. In the milder cases, the bones and periosteum are affected by a chronic inflammatory process ; those suffering most which are most exposed. In the more severe cases, suppuration takes place ; sometimes superficial, between the bone and periosteum ; sometimes in the interior of the bone ; sometimes involving the whole girth of the bone ; and resulting in ulceration, caries, or necrosis. Sometimes the skeleton is affected symmetrically ; corresponding bones suffering at corresponding points ; but it may happen that the whole of one side is free, while scarcely a bone of the opposite side of the skeleton is not more or less affected. The joints are liable to pain, stiffness, and chronic enlargement ; similar to chronic rheumatic affections of these parts. The skin is liable to be attacked—more especially after the fourth class of sores—by tubercular formations, which assume the characters of *rupia prominens*, and degenerate into foul irritable sores ;

sometimes the initiative is by vesicular formation ; sometimes the sore at once is formed by sloughing, followed by acute ulceration. The mucous membrane of the alimentary canal is liable to suffer at either extremity, but especially in the fauces—by congestion, and troublesome ulceration, usually of a chronic yet intractable kind ; the anus may be the seat of aphthous ulceration, fissures, and condylomata. The tongue may become generally swollen ; indurated at several points ; at the edges and tip superficially ulcerated—the sores irritable and obstinate, sometimes spreading as if by a chronic phagedæna ; and the mucous surface of the cheeks, and gums, as well as beneath the tongue, may be similarly affected. Deafness is no unfrequent occurrence ; probably from congestion of the mucous lining of the ear. Iritis and bubo sometimes occur, in this class ; the latter usually indolent ; and the former tending less to severity than when a secondary symptom. The testicles not unfrequently undergo chronic and simple enlargement, with or without accumulation of serum in the tunica vaginalis.

Tertiary symptoms are not transmissible in any way. Whatever their connexion, mercury is superseded, in treatment, by the iodide of potassium ; and this is assisted by attention to the general health—more especially as regards warm bathing, clothing, and regimen—and by other alteratives, if need be. In ostitic affections, obstinate, and attended with much nocturnal exacerbation, opiates are essential ; and it may be that, ordinary means failing, we may be driven to small doses of corrosive sublimate. In obstinate affections of the skin and throat, the “*liquor hydriodatis arsenici et hydrargyri*” may be of service. The local affections of bones, joints, testicles, glands, are treated according to the general principles of surgery.

In the tertiary symptoms following the fourth class of sores, the general rule still obtains as to the propriety of avoiding the use of mercury. There are cases, however, of occasional occurrence, which compel its exhibition. When the face, or other part of the surface, is covered with ulcerating tubercles, when the tonsils are ever and anon the seat of bad ulceration, and when the tongue and cheeks are affected with a constant succession of painful ulcers, surrounded by induration, and extremely slow to heal ; when such symptoms have resisted the ordinary non-

mercurial treatment, and the patient is obviously declining in health—in such cases, an alterative course of arsenic is sometimes of much service. But, if it fail, mercury is had recourse to ; in combination with small doses of the iodide of potassium ; and usually with the very best effect.

The iodide of potassium is of great use in the treatment of all venereal affections ; as an eliminator, probably, of the virus, as well as an alterative of the system. It is best given in the form of solution ; beginning with a dose of two or three grains, given thrice daily ; and gradually increasing it to half a drachm, or more, according as it is borne. It is not always necessary to induce the physiological effects. Some have a strong prejudice in favour of eight grains thrice daily, in camphor mixture ; and adhere to that dose, throughout the whole period of the exhibition ; seldom finding any decided intolerance manifested by the system. If a primary sore is slow to change, and to assume the healing process, this medicine is useful ; provided there be no inflammatory excitement in either part or system—for that provision is always essential to its proper administration. In many of the secondary symptoms, it supersedes the use of mercury, in the chronic stage. And, in the tertiary symptoms of every kind and complication, it is pre-eminent and paramount. Sarsaparilla and guaiac, in the form of the compound decoction, are also not unimportant auxiliaries. Some affect to believe them quite inert ; but we beg humbly to vouch for their possession of an important though minor virtue. In cases of intolerance of the iodide, by reason of idiosyncrasy, they often prove most valuable and efficient substitutes.

The use of Mercury in Syphilis.

That mercury is a specific—indispensable as well as infallible—for the venereal disease in all forms, is a maxim which, happily for mankind, is fast falling into desuetude. It is now abundantly established, that many forms of the disease—nay the greater number of cases—are capable of perfect cure without the use of this mineral ; that, by simple means—that is, non-mercurial—the cure is shorter, the symptoms prove less grave, and immunity from future calamity—connected with

the attack, its progress, or its mode of cure—is much more certain. In other words, the system is cleared quite effectually of the venereal poison ; and it is saved from the pernicious effects of the mercurial poison—perhaps the more formidable of the two. There are certain cases, however, in which it has been shown, by experience, that a satisfactory issue cannot be obtained without recourse to mercury. And, in those cases, its judicious employment seldom leaves any deleterious impression on the system ; there being then a decided tolerance of its administration.

Its *modus operandi* is yet involved in uncertainty. Many, especially of the old school, still believe that it has a specific and destructive influence on the venereal virus ; that the two poisons meet in the circulation, and that a destructive influence is exercised there by the mercury on its antagonist. This may in part be true ; but it seems reasonable to conclude, that its beneficial operation mainly depends, like that of other constitutional remedies, on its alterative influence on the general system, and on its power of stimulating secretion and excretion, so favouring elimination. Long ago, it seemed the general belief, that such elimination was mainly to be achieved through the action of the salivary glands ; that the poison, overcome in the blood, was to be excreted from it in the form of tainted saliva ; and that the more speedily it was thrust out by the mouth, the more rapid and satisfactory would be the cure. Mercury, accordingly, was pushed invariably to profuse salivation ; either in the belief that such was necessary for satisfactory elimination ; or holding that copious ptyalism was the only sure sign, of the mineral having been so thoroughly introduced into the system as to afford a good prospect of the poison's annihilation. In the beginning of the sixteenth, and end of the fifteenth centuries, when the venereal disease experienced such an aggravation as to alarm all Europe, the antidote was plied with a blind, empirical, and desperate profusion ; and there is no doubt that, to this circumstance, rather than to any unusual virulence in the disease itself, its frightful ravages at that period are to be attributed. The primary symptoms were bad ; but the secondary and tertiary symptoms were far worse ; under the last, the most frightful deformities and

mutilations occurred—by affections of the bones of the face and cranium, and destruction of the soft parts in the nose, mouth, and throat—and death was no unfrequent termination of the hideous misery. Now-a-days, we find no such severities, except when mercury has been heedlessly and unnecessarily given—perhaps in a strumous habit. And the undoubted rarity of mutilation, deformity, and death, by any part of the venereal disease, in the present day, is reasonably to be attributed to a greater prudence in the treatment of the affection, more especially in the primary and secondary symptoms. Mercury is withheld in many cases, if not in most; when administered, it is given in moderation, and with a reluctant hand; alteratively, not cumulatively; frequently stopping short of ptyalism; never going beyond mere touching of the gums. Formerly, the ordeal of salivation was such, as must have proved to many frames quite intolerable. Even Boërhaave, in the eighteenth century, laid down the following “axioms;” “if there is four pounds of saliva spat every twenty-four hours, it is sufficient;” “the salivation is to be continued until the symptoms of the disease vanish, which generally takes up six-and-thirty days;” and “a small dose of mercury must be taken for six-and-thirty days more, to keep up a gentle salivation.” No wonder that patients died; and no wonder that some were found to prefer death to such a mode of cure!* And yet, while, in Europe, suffering humanity was thus outraged by the profession, the natives in the West Indies, by the aid of guaiac alone, were showing an infinitely more favourable result. And among the former, too, there were not wanting some who became alive to the folly and danger of indiscriminate and extreme mercurialization; some driven to a better mode of reasoning and practice, by the stern rod of personal experience—Ulric de Hutten had himself been salivated eleven times, and thereafter became a zealous apostle of a treatment opposed to that of the majority of his fellow-practitioners.

* “Omnibus certe exulcerebantur fauces, lingua, et palatum; intumebant gingivæ, dentes vacillabant, sputum per ora sine intermissione profluebat, unde et labia sic contacta ulcus trahebant, et intus buccæ vulnerabantur. Fœtebat omnis circa habitatio, atque adeo durum erat hoc curationis genus, ut perire morbo complures quam sic levare mallent.”—ULRIC DE HUTTEN, 1519.

But, while it is contended, that mercury and the venereal disease are not inseparable—that a patient affected with the one is not inevitably to be affected by the other—it is yet to be admitted, gratefully, that this mineral is, in not a few cases, a most important remedial agent; used, however, much more sparingly than in former times; and, in consequence, not only more efficient as a means of cure, but also less likely to peril the future durability and soundness of the frame. By reference to statistics, it has been found, that mercury, indiscriminately given in all cases, does not accelerate, but that on the contrary it retards, the ordinary healing of primary sores; that it does not prevent secondary symptoms, and that these coming after its exhibition are generally severe; and that the tertiary symptoms are both most frequent and most severe, when mercury has been profusely given in the previous stages. On the other hand, an indiscriminate withholding of mercury, in all cases, will present a much less favourable general result, than when mercury is judiciously exhibited in those examples of the disease in which it is found by experience to be not only useful, but in a great measure absolutely necessary to the full and satisfactory elimination of the poison.

If the ectrotic treatment of the primary sore have been successfully achieved, of course no mercury will ever be required; there is no poison in the system, with which it is required to contend. But, failing this, it is given—1. In the second class of primary sore, when it proves obstinate; 2. In the third class of primary sore, always; 3. In the papular and exanthematous secondary eruptions, only when they prove obstinate and recurrent; 4. In the pustular secondary eruption, if it prove obstinate; but not if it be consequent upon the fourth class of sore; 5. In the scaly secondary eruption, following the third class of sore, always; 6. In iritis, actively, unless when the affection results from the fourth class of sore; 7. In otitic affections, of tertiary occurrence, when other means have failed to procure rest, alleviation of pain, and decadence of the constitutional irritation; 8. In tertiary affections of the skin and throat, of whatever origin, which have obstinately refused to yield

otherwise. 9. Experience also shows it to be essential to the removing of that secondary taint of system, whereby the parent conveys syphilitic suffering to the child.

It is never given ; 1. In any case, during acute inflammation in the primary sore ; otherwise, the ulcerative action will certainly sustain aggravation, and sloughing, or phagedæna, may be induced. 2. Nor in any case, during persistence of febrile excitement in the system ; otherwise, the cure will be delayed, and the symptoms aggravated. 3. Nor in any form of disease connected with the fourth class of sores—excepting the rare cases of a tertiary character already specified—otherwise, such aggravation is to be dreaded, as will either end fatally, or fix the deleterious poisons permanently in the frame. 4. It is well to avoid mercury, also, if possible, whenever the active presence of scrofula is plainly and prominently indicated.

The mode of exhibition varies according to circumstances. 1. It may be given in the form of calomel and opium ; in the ordinary way. 2. Or the blue pill may be given, in such doses as the cure demands ; combined with opium or hyoscyamus, if pain or purging be occasioned ; if mere griping occur, it may be enough to let each dose follow closely on a meal. 3. Either of these forms disagreeing, the hydrargyrum cum cretâ will probably be found suitable ; and this is the preferable form for children. 4. The corrosive sublimate, in very small doses, in pill or solution, is generally preferred in obstinate ositic affections. And in such cases, also, it is sometimes of use to combine the mercurial with small doses of the iodide of potassium. 5. In habits suspected of struma, the iodide of mercury is a suitable form ; or a combination with iron may be given, in the “ferruginated” blue pill. 6. Inunction is useful, as an adjuvant to the internal exhibition, when speedy affection of the system is desirable ; in iritis, for example, mercurial ointment is rubbed on the forehead and temple, while the calomel and opium are given internally. It is also used alone, in cases which exhibit an intolerance of the remedy given internally, in any form ; then it is rubbed in, night and morning, in the axillæ, or on the inside of the thighs. 7. Fumigation, also, is sometimes employed ; when other forms seem to disagree. The fumes are

obtained from the red sulphuret, put on a heated iron ; and they are applied to the system, by inhalation ; to a part, by means of an oiled-silk tube or bag. Fumigation, however, is seldom used, except in cases of obstinate chronic affection of the throat, and tertiary enlargements of the testicle.

In the primary affections, amendment usually shows itself, before the mineral has given any other evidence of having affected the system. In the secondary affections, the yielding is seldom so rapid ; such continuance is usually necessary as touches the gums ; then the remedy is no longer pushed ; but a minor dosing is maintained ; the object being not to increase, but simply to maintain, the approach to ptyalism, until decadence begin to appear satisfactorily ; and then the remedy is altogether withdrawn ; although, it may be, that persistence or recurrence of the symptoms may require its resumption. In tertiary symptoms, also, it is generally necessary to attain to the evidence of systemic seizure ; maintaining it, if need be, with the same niggard caution and economy.

Certain idiosyncrasies require consideration, in regard to the exhibition of this medicine. 1. Some patients are slow to show ptyalism, even under great and sustained doses. In them, it is not necessary to push the medicine until ptyalism is produced. 2. Others have their mouths touched—perhaps severely—with but a few grains. And, in their case, the dosing must be both minute and guarded. 3. Some suffer by pain and purging, in whatever form the mercury is given internally. In these, careful inunction is to be made trial of. 4. Some are actually poisoned by the mineral ; the condition termed *Erethismus* being induced. To such patients mercury can never be given, in any form ; for, the symptoms induced are such as imminently to endanger life ; the patient is anxious, under an apprehension of great and impending evil ; his muscular system is prostrate ; he trembles, walks with difficulty and uncertainty, and his heart's action is weak and fluttering ; breathing is difficult ; an unpleasant sensation of weight or tightness is felt at the præcordia ; both mind and body are incapacitated for all exertion ; and, during some ordinary effort, he may expire, by syncope. Such symptoms require instant discontinuance of the mercury, re-

moval to a better and freer air, cautious use of stimuli, friction of the chest, generous diet, and avoidance of all exertion and excitement. 5. The system may not suffer, but the surface may ; a very troublesome eruption occurring ; vesicular, the *Eczema mercuriale*. This may be the result of either external or internal exhibition ; when the former, it usually occurs in and around the part on which the ointment or plaster has been applied ; when the latter, the first appearance is usually in the axillæ, or on the inside of the thighs, and thence the eruption may extend over the trunk. The vesicles soon break ; and, instead of healing, are apt to degenerate into painful excoriations. Sometimes, there is smart attendant constitutional disturbance. The treatment is by instant removal of the cause, and by exhibition of the soothing remedies which are suitable to such eruptions in general ; the pain may be assuaged by opiate applications, the itching by an aqueous dilution of the hydrocyanic acid. Liability to such an eruption does not forbid the use of mercury ; but requires that it should be administered, when essential, in small doses, and with unusual caution. Its external use is certainly contra-indicated. 6. Some systems evince their intolerance of the remedy, by gradual loss of flesh, strength, and spirits—an asthenic state, approaching to hectic, becoming established. In such circumstances, the mercury is to be discontinued ; generous diet, with tonics, is given ; and the cure of the venereal affection must be sought, by other than mercurial means.

Violent salivation may be caused by imprudent and excessive dosing, and by sudden exposure to cold during the use of the medicine ; or it may depend on an idiosyncrasy of system. The mercury must be discontinued ; diet should be low ; cool and pure air is to be breathed ; and the mouth is to be rinsed, and the throat gargled, with weak brandy and water, or with solutions of the chlorides. If this prove insufficient, leeches are to be applied over the angle of the jaw, followed by fomentation ; so that a directly sedative effect on the salivary glands may be obtained. After the febrile excitement has abated, diet is improved ; and the superficial ulcerations, in the oral and faucial mucous membrane, are touched occasionally with the nitrate of silver.

Of the remote evil consequences of mercury on the system, much might be said. Of itself, sakelessly given, it may cause the most obstinate and serious affections of the skeleton. Associated untowardly with the venereal poison, its evil results show themselves as tertiary symptoms—or even at a still more remote period—and may be most formidable :—nodes, ulcer, caries, necrosis of bones ; intractable ulcerations of throat, tongue, cheeks, and gums ; exfoliation of the hard palate, and of the nasal bones ; lupous ulceration of the nostrils, lip, or face ; hideous deformity by loss of the nose and palate ; caries of the skull, perhaps implicating the interior by perforation ; ulcers and tubercular formations in the skin and cellular tissue ; pain, misery, and death. Such calamities, happily, are now rare ; but our museums can yet speak to their frequent occurrence, in times not long bygone. The worst evils occur, when the mercurio-syphilitic cachexy is aggravated by association with the strumous. In treatment, we have not much in our power ; and we may well plume ourselves more on prevention than on cure. The iodide of potassium, and sarsaparilla, are the only remedies which deserve a special mention, as antagonists of this depraved state of system ; the rest is done by general treatment and hygiene.

Syphilis in the Child.

A father, labouring under secondary syphilis, may transmit the taint to his wife ; and she may communicate it to the foetus in utero, affording it a poisoned blood in nutrition. Or, a mother, labouring under genital sores, may communicate direct contagion to the child during parturition. Or, the child may be infected, at a more remote period, by suckling a female possessed of secondary syphilis ; the milk coming from tainted blood, and charged with the virus accordingly. Thus, in one or other, or in all of these ways, the disease may be communicated at the earliest age. Sometimes the child is born, labouring under the symptoms ; more frequently, they show themselves after birth. The more prominent are—hoarseness of voice ; a shrivelled, lean state of body ; an anxious expression of face, often senile ; chaps at the

flexures of the limbs, and on the nates ; a copper-coloured eruption, sometimes studded with pustules, more frequently scaly ; discharge from the nostrils ; excoriation of the mouth and throat. When the mother is contaminated at an early period of pregnancy, the child seldom arrives at maturity, but comes away dead and putrid, as an abortion ; and this may happen repeatedly, until a complete elimination from the parent's system has been obtained. For this purpose, a mercurial course is generally necessary—as can be readily understood, seeing that it is generally the true syphilis, or scaly eruption proceeding from the true chancre, which is communicated in this way. For a like reason, mercury is generally necessary in the child. It may be given indirectly through the nurse ; or directly—as is to be preferred in most cases—by inunction, or by guarded doses of the hydrargyrum c̄ cretâ internally. Or, mercurial ointment may be spread on flannel, and bound round the trunk once a day, until the symptoms yield. In nursing, precaution is necessary ; as a healthy nurse may certainly have constitutional syphilis communicated in this way ; the excoriated or ulcerated lips of the child producing a similar condition of the mamilla, and the ordinary class of secondary symptoms following. It is quite possible, that sometimes the sores on the child's mouth may be primary, caused by the lodgment of virus there during parturition—the unfortunate mother labouring under primary disease at the time.

Syphilis in the Female.

In the female, syphilis is peculiar only as regards the primary affections ; and their peculiarity is chiefly as to their site ; their general character, progress, and results, being very similar to the occurrences in the male. Females are more subject to condyloma ; and, if cleanliness be neglected, warts are very liable to form, sometimes attaining to large size, and involving the labia in hypertrophy. The sores are usually situated on the inner surface of the nymphæ, and in the orifice of the vagina ; they are also found in all parts of the vagina, on the os uteri, and sometimes in the urethral orifice ; sometimes they affect the anus. Treatment is as in the

male. The warty formations occasionally are such, as to require a regular dissection for removal of the hypertrophied mass.

Pseudo-syphilis.

Certain diseases, not supposed to be of venereal origin, resemble some of the forms of constitutional syphilis more or less closely; the Radesyge in Norway; the Button-scurvy in Ireland; the Yaws in America; the Sibbens in Scotland—this, however, lately supposed to be identical with the constitutional disorder consequent on condyloma. (P. 529.) These affections belong to the province of the physician.

CHAPTER XXXIV.

AFFECTIONS OF THE URETHRA.

Stricture.

CONTRACTION of the urethra may depend on one of three different causes. 1. There may be *Spasm* of the muscles connected with the membranous portion of the urethra, causing temporary diminution of the calibre at that part, as well as resistance to instruments attempted to be introduced; and there seems reason to believe that a similar result is sometimes occasioned, in the anterior portion of the urethra—where muscular fibres do not come into play—by a turgescence of the lining membrane, analogous somewhat to the erection of erectile tissue. These conditions are liable to be suddenly induced, by ordinary exciting causes; and they generally disappear readily—often rapidly—under ordinary treatment; hip-bath, fomentation, opiate enema or suppository, perhaps a sedative internally, rest, quietude, and antiphlogistic regimen. 2. *Inflammatory action*, by its attendant swelling, may cause contraction. It may affect the lining membrane itself; either at one point, as in consequence of injury; or over a considerable space, as in severe gonorrhœa.

One of the symptoms of the latter affection is an obvious diminution of the stream of urine, dependent on the contracted state of the canal. Or, the inflammatory process may be exterior to the urethra ; in the substance of the prostate, in the cellular tissue of the perineum, or by the side of the rectum ; and the bulging of the phlegmon, or abscess, may not only diminish the calibre of the urethra, at the affected part, but may even shut it up altogether, causing retention of urine. The treatment of such a case has already been considered ; it is by antiphlogistics ; withholding the catheter as long as possible, and using the bistoury for evacuation of matter at the earliest practicable period. 3. The canal may be narrowed by chronic structural change, occurring in the urethra itself ; and this constitutes true *Stricture* ; a condition which is ever liable to aggravation, by the two preceding causes of contraction—spasm and inflammatory action. And it is well to limit the use of terms thus ; understanding the “spasmodic stricture,” and the “inflamed stricture,” to be aggravations of the true organic stricture in one or other of these ways ; understanding the terms “spasm of the urethra” and “urethritis,” to include the condition of temporary narrowing of the canal by spasm and the inflammatory process ; and understanding by “stricture,” an organic change in the urethra, causing a narrowing of the canal, which may be altogether independent both of spasm and of an existing inflammatory process.

But, stricture results from the inflammatory process, in and near the urethra ; and this, as we have seen, may be excited in various ways. 1. It may follow the application of a specific virus, as in gonorrhœa ; and this is perhaps the most frequent cause of stricture. Clap is of common occurrence ; the inflammatory process is usually of long duration, as well as of such a kind as to favour plastic exudation ; and the treatment by injection is not unlikely to be so misconducted, as to cause maintenance or aggravation of such action. 2. Stricture may follow a chronic inflammatory process, always of a minor grade—never reaching beyond active congestion—occasioned by constant excitement of the canal ; as by excess in venereal indulgence, or by an acrid state of the urine. The latter is no uncommon cause ; the urine may be simply acid, in

excess ; or it may hold more or less deposit ; the bladder is emptied frequently ; and, on each occasion, the urethra smarts under the passage of the urine. At length, a continued state of congestion is induced ; and that brings not only discharge from the free surface of the mucous membrane, but also a certain amount of plastic exudation which remains.

3. External injury may be the exciting cause ; lighting up an active inflammatory process in and around the injured part, and tending much to solid deposit—not always easily removed by absorption. Hence, blows and kicks on the perineum are found to produce the worst forms of the affection. A less amount of violence, often repeated, may induce a gradual formation of stricture ; as by contusion of the perineum on the saddle, in dragoons, or others much employed on horseback. Also, there is good ground for fearing, that the disease not unfrequently originates in the unskilful and untimely use of bougies, lithontriptors, and other instruments. 4. Ulceration of the urethra cannot well heal, without causing more or less contraction of the canal ; and this ulceration may be the product, either of a common or of a specific inflammatory process. There is no more troublesome stricture, than contraction of the orifice, in consequence of venereal ulceration there.

The proximate cause of stricture is, plastic deposit, and consequent structural change, both in the substance of the lining membrane of the urethra, and also in the submucous cellular tissue ; and it is important to remember, that it is in the latter situation chiefly that the deposit takes place. The ordinary sites of stricture are,—at the orifice ; at the neck of the glans, about an inch from the orifice ; at the natural bend of the penis, from the suspensory ligament, between three and four inches from the orifice ; and at the membranous portion of the urethra, between six and seven inches from the orifice. The most frequent are the two last named. But it is seldom that a tight stricture is found at the posterior part of the urethra, without more or less contraction also at the ordinary sites in front ; in other words, in cases of bad stricture, a plurality of contractions may generally be expected. When the affection results from external injury, the site obviously depends on the application of this.

The extent and degree of contraction vary. Sometimes, a shred of plastic deposit passes across the canal; and this rare form is termed the bridle-stricture. Sometimes the stricture is tight, but very limited, seeming as if a thread had been tied tightly on the part. More frequently, the contraction is of greater extent; from a quarter of an inch to an inch; sometimes involving several inches of the canal. And the degree of contraction varies, according to the duration and treatment of the disease, from the slightest narrowing of the canal, to its complete occlusion.

Behind the constricted point, dilatation takes place. Anteriorly to the actual stricture, there are collapse and contraction. The dilatation may be to such an extent as to hold more than one ounce of urine; and the mucous lining of the dilated part becomes prone to ulceration. Calculous matter may be retained there; and a stone may form, occupying the whole space. The whole mucous lining sympathizes more or less. From the strictured part, and also from the general surface of the membrane, an anormal discharge proceeds; usually clear, sometimes puriform; and liable to be increased by casual excitement—this inducing aggravation of the congestion. The lining membrane of the bladder becomes similarly affected; the muscular coat too is changed, becoming hypertrophied; and, in consequence, both fasciculation and sacculation of the viscus take place. The enlarged muscular fibres, arranged in fasciculi, act strongly on the urine; and the urine, not getting freely away through the strictured urethra, reacts on the mucous membrane, causing protrusion of this through the interspaces of the fasciculi. Cysts, thus formed, receive gradual additions to their parietes, and may attain to a large size—rivalling the bladder itself in magnitude. Chronic cystitis may follow. And morbid sympathy does not end with the bladder; the kidneys are in many cases involved; first in irritation, causing functional derangement only; afterwards, in organic disease. The pelvis of the kidney, and the ureters, are often enormously dilated, their lining membrane furnishing much puriform discharge. The formation of stone, too, is favoured, as was formerly remarked; derangement of the kidney's secretion leads to calculous de-

posit, and this is obstructed in its outward passage by the urethral change.

The symptoms of stricture are of gradual invasion, and may for some time escape the patient's notice. The urine is passed in an attenuated stream, sometimes twisted, sometimes scattered; the act is both frequent and tedious; and sometimes it is accompanied by pain and uneasiness in the bladder and penis, which abate on the bladder being emptied. After the patient supposes evacuation complete, a few drops—in some cases, a considerable quantity—pass away involuntarily; coming from the dilatation behind the stricture. In consequence, the clothes are usually soiled and stained. The increased frequency of micturition is most observed at night. Discharge comes from the urethra, as already stated; and excess in diet or exercise may induce an aggravation, resembling an attack of gonorrhœa, and very probably implicating the bladder. Pain is complained of in the loins and thighs, and in the perineum; often erection is painful. In tight strictures, the urine may pass only guttatim; and then there may be no escape of semen in emission—this fluid passing backwards into the bladder, to be afterwards discharged in an altered state along with the urine. The testicles are liable to enlargement; and the rectum frequently sympathizes—becoming prolapsed, or inflamed, or fissured, or ulcerated, or affected with hæmorrhoids; sometimes strictures of the urethra and of the bowel are found to co-exist. The straining, in bad cases, is such as to empty the rectum as readily as the bladder; and the water-closet has to be used, instead of the chamber-pot. Often hernia is induced. The prostate is liable to enlargement; and if this be chronic and simple, relief from the symptoms of stricture may be experienced; the prostatic enlargement acting as a breakwater, in favour of the part originally affected. But, if ulceration or abscess affect the gland, then aggravation must necessarily ensue. As the kidneys suffer, their secretion becomes more and more changed; and the acrid urine, passing frequently along the urethra, reacts unfavourably on the urethral disease. The complications of ague and gout are by no means unfrequent, in those advanced in years, and who have lived freely. Re-

tention of urine is at any time liable to occur ; the degree of constriction being suddenly increased by spasm, or by inflammatory action, or by both. From this cause, extravasation of urine may follow ; urinous abscess, however, ending probably in the formation of fistula in perineo, is more common—generally causing mitigation of the symptoms, at least for a time, as will afterwards be explained. In severe and protracted cases, the general health suffers materially—independently of all accident ; the flesh and strength fail, the digestive organs are impaired, the face is sallow, and the features wear an expression of anxiety almost pathognomonic of the disease. Constitutional irritation sets in ; the symptoms denoting organic disease of the kidneys become more and more marked ; and the patient perishes.

Treatment is conducted on simple principles ; but a satisfactory cure is often of very difficult attainment. Our object plainly is, to get rid of the redundant deposit ; and this may be effected in one of two ways : 1. By simply procuring absorption of the deposit, under the stimulus of pressure ; 2. By so managing the application of pressure, as to establish a temporary and active congestion in the part, which, on its resolution, may induce a rapid diminution of the deposit—somewhat in the same way as the injection of a hydrocele removes a redundancy of serum, (*Principles*, p. 156.) Advance of such action to a high grade is obviously to be avoided ; true inflammation will cause further deposit around ; and ulceration—at the time perhaps widening the canal—must ultimately lead to a renewed and probably aggravated contraction, by puckering of the cicatrix. Besides, ulceration, to prove effectual on the submucous deposit—the true cause of the stricture—must first penetrate and destroy the mucous membrane ; an event never desirable.

To obtain the curative result, cautious management of the metallic bougie is now universally acknowledged to be the most suitable means. But, in the first instance, exploration is necessary ; to ascertain whether a stricture exists or not, as also its nature and extent. A metallic instrument may be used for this purpose ; but one of wax is often preferred, as less formidable to the patient, and capable of conveying more explicit information as to the state of the ure-

thra. A large one is not suitable, obviously; neither is one of small size—for it is liable to catch a lacuna, and so to indicate stricture when there is none; or, passing through a stricture of no great tightness, it may lead to the belief that the canal is clear, while contraction really does exist. One of a medium size is selected; and, having been warmed gently, and made pliable, by the hand, is introduced cautiously. If obstructed, it is gently withdrawn a little, and then pushed on again; a fold of the urethra may have been in the way. If, however, still opposed, the existence of stricture may be fairly presumed; and its site is noted, by observing the extent to which the instrument has passed. To elicit further information, the bougie is pushed steadily onwards, so as to fix its point in the stricture; and, on withdrawing it, a tolerably accurate idea is obtained of the extent and character of the contraction, by observing the marking of the instrument's point. The wax bougie is then laid aside; its office is exploration; and now, for the cure, one of metal is taken up, of such a size as is likely to pass, without much difficulty. The most convenient kind of bougie is that manufactured of Berlin silver; hollow, and consequently light, yet firm enough; and always possessing a smooth surface. The curve should be gradual and slight—a segment of a large circle; and the set of instruments are arranged in a gradually ascending scale, from the very smallest wire-like form, to what is likely to fill the average canal in its normal state. The selected instrument, oiled, or smeared with cold cream—sad mischief has happened from croton oil having been mistaken for the bland fluid—is passed down to the seat of stricture, and steadily pressed onward, with intent to pass through it. Having succeeded in this, the instrument is permitted to remain, from a minute to half an hour, according as the patient's feelings may indicate. If sickness occur; or if much pain be felt, and on the increase; or if the patient express a decided wish for removal of the instrument, stating his belief that it is "hurting" him—it should be withdrawn; remembering that our object is, to excite not inflammation, but absorption only. Rest and temperance are essential, for that day. On the second or third day, we expect the uneasiness occasioned by the former introduction to have passed away; and the

operation is repeated ; introducing the same instrument as before, then immediately withdrawing it, and substituting a size larger. And this is repeated, at longer or shorter intervals, until the full size is passed readily. This is repeatedly introduced, for some time, at the ordinary intervals, until all obstruction has fairly disappeared ; and then the stricture may be regarded as cured—though not finally disposed of. A tendency to recontraction remains. And, to obviate this, an occasional bougie is required, at a gradually increasing interval ; the first introduction taking place at the end of a fortnight, then after a month, then after two months, and so on ; until, after introduction at an interval of six months, all is found normal. Thus, only, can immunity from relapse be secured.

Such is the ordinary course of events, in a plain and simple case ; but many circumstances require attention besides. And, in the first place, in commencing the treatment of stricture, it is essential to have regard to the general health, and especially to the state of the urine. If an acrid fluid be frequently passing over the canal, little or no progress can possibly be made ; the disease need not be expected to give way, while a cause of maintenance, if not of origin, is in constant operation. It is also very important, that regimen should be strictly regulated ; and that exercise should be indulged in as little as possible. Horseback exercise must be absolutely prohibited.

The instrument is held lightly in the hand, and is never pressed onwards with much force. Force of propulsion, and tightness of grasp, may tear the urethra, pushing the unentered stricture before the instrument's point—if this be kept straight ; or, if any divergence be made from the true direction of the canal, the parietes are perforated, and a false passage is established. Lightness of grasp, and gentleness of propulsion, permit the instrument to be restrained by the walls of the urethra ; and all such hazards are avoided. The point is pressed steadily on the stricture for a short time ; and then, withdrawing the hand, we observe whether the instrument resiles, or remains fixed in its place ; if the former event occur, it is a sign that no penetration of the stricture has taken place ; the latter is a token of the instrument's

point being lodged in the contracted part. And according to the evidence thus afforded, either a smaller instrument is selected, or the onward pressure is steadily maintained. In the latter case, our chief care is to avoid the use of force, and to exert the steadily maintained pressure not on the sides of the canal, but on the obstruction in its direct course ; and, to assist in this, when the stricture is behind the bulb, the forefinger in the rectum is sometimes of use.

An obstacle may be felt at the bougie's point, near the neck of the bladder ; and yet it may not depend on stricture. The canal may be of its normal calibre throughout ; but made tortuous, by unequal enlargement of the lobes of the prostate. In such a case, a flexible instrument is more likely to pass than one of metal ; the passage is to be coaxed, not forced— "*arte, non vi*"—and much assistance is derived from the finger in ano. Another obstacle, not connected with stricture, may be occasioned by osseous deposit on the rami of the ossa pubis, or upon their symphysis ; the result of injury, or of idiopathic ostitis. It is of rare occurrence. A cautious turning of the instrument's point to a side, will probably elude such obstruction.

A stricture, at first wholly resistful of the instrument's point, may in a short time yield to it. Instead of attempting at once to penetrate, therefore, steady pressure is kept up ; and, after a few minutes, we may expect such an amount of relaxation to take place as may admit either of the instrument passing completely, or of its becoming lodged in the strictured part.

It is not essential to the cure, that penetration should be complete at first ; and this undoubted fact has an obvious and important bearing on practice. Having found a very tight and unyielding stricture, which will not, without force, permit penetration, even by a very small instrument ; and if there be no threatening of retention, or other urgency ;—we lay aside the small bougies, and the determination to penetrate, and, selecting an instrument of medium size, pass it down to the stricture, and retain it there—on the stricture, not in it—as long as the patient's feelings will allow. This is repeated, at the usual intervals. And, after several such introductions, relaxation will be found gradually advancing,

so as to admit first of partial lodgment, and afterwards of complete penetration. No time is lost ; and no risk is incurred. The principle of cure is obviously the same as that of the ordinary use of the instrument.

Should, at any time, over-excitement—as evidenced by tendency to bleed, pain, spasm, and discharge—occur in the part, from over-use of the bougie, exposure to wet, fatigue, intemperance—all instrumentation must be desisted from, for a time ; until, by rest, and antiphlogistic regimen, a quiet and tractable condition of the canal has been restored.

In receiving the bougie, the patient may be either erect or recumbent. If it be his first experience of such an operation, the latter posture is preferred ; lest faintness occur, as is apt to be the case. After one or more repetitions, such tendency ceases ; and then the erect posture is the more convenient for both parties. The surgeon, seated in front, passes the instrument with its convexity directed towards the abdomen, down to the suspensory ligament ; and then, gently depressing the handle, while the instrument is slowly turned half round, this natural obstruction is overpassed. To avoid injury to the canal here, it is well to move the point mainly on the upper surface of the urethra. If an opposite course be followed, a fold of the membrane is almost certain to be caught ; and then a rash pressure cannot fail to cause anormal penetration—a *False Passage* is begun.

The evidences of a false passage being formed, are :—a consciousness of having used an unusual and unwarrantable degree of force ; an uncertainty as to the point having been in the true direction ; a want of the ordinary sensation of being grasped, as the pressure is continued ; a sensation of something having suddenly yielded ; when pressure is then continued, a feeling of roughness and rubbing on the instrument's point—and the bougie is then apt to advance, not smoothly, but per saltum ; a complaint from the patient of unusual pain—perhaps with a start, and then faintness ensuing ; blood welling out, in greater or less quantity, by the side of the instrument. Very frequently, the patient decidedly corroborates our own apprehensions, by declaring his conviction that the normal canal has been departed from.

Such things ought not to be ; the risk is great. And they

need not be ; for, by avoidance of force, and by the exercise of ordinary caution and skill, all such accidents are rendered more than unlikely. The only circumstances in which force is at all excusable, are those of urgent retention. Then the bladder must be relieved, as we have seen. But, of all the methods of affording relief, forcing the stricture is probably the worst. If there be time and indication, leeches, fomentation, hot-bath, sedatives, and antispasmodics are tried ; and, failing these, the obstruction is overcome by incision.

The risks of false passage are :—1. Escape of urine, and consequent sloughing or abscess, according to the extent and manner of the infiltration. If the false passage be incomplete, opening into the urethra only on the distal side, urine does not enter so readily as when the perforation is complete—when the perforation has both a distal and a proximal opening. The incomplete form, consequently, is more likely to cause urinous abscess ; the complete, urinary infiltration. 2. Hæmorrhage may be considerable. 3. Inflammatory action may seriously affect the part, causing softening and ulceration ; and healing cannot take place, without great contraction—worse, probably, than the original stricture. And, besides, during the persistence of inflammatory action, constitutional disturbance is likely to be severe, bearing hard on a system already enfeebled. 4. Or, in the especially feeble, a formidable amount of constitutional irritation may occur, irrespective of local inflammation.

A false passage having been formed, it is with difficulty avoided in subsequent introductions of the instrument. For some days, nothing should be passed along the canal ; an opportunity being thus afforded for closure of the track ; or, at least, for such diminution of it as may render entanglement of the instrument less likely. And when this is again used, it must be with a very lively caution ; the hand being alert, as it were, to notice the first and slightest deviation from the normal path.

In some patients, there is an especial irritability, which tends to balk the bougie ; perineal spasm supervening, on the introduction being attempted, and receiving obstructive aid, probably, from a turgescient state of the lining membrane. Such a difficulty may be partially or altogether

avoided, by the exhibition of a moderate opiate, by the rectum or mouth, about half an hour before the attempt at introduction. Other patients are liable to suffer from agueish attacks, after use of the bougie. Such are generally elderly persons, who have lived freely and been abroad. They benefit greatly by the use of sulphate of quinine.

Hitherto, we have been speaking only of the ordinary cases which require the ordinary application of instruments, in expectation of the ordinary result—disappearance of the redundant deposit, by absorption; this absorption being excited, simply and directly, by pressure. We now come to another class of cases, requiring another effect of the instrument—the second which we formerly noticed; excitement of an active congestion, whose resolution may carry with it removal of not only its own effusion and exudation, but also of the deposit of former times. These are very tight and unyielding strictures, of considerable extent, and long duration. A very small instrument may be insinuated into or through them; but no progress is made; on each introduction, there is the same difficulty to be overcome. In such cases, the treatment requires a modification; a higher result is to be obtained from the instrument's use. A firm silver catheter is carefully passed through the stricture; and is retained by tapes, appended to the rings of the instrument, and secured, as the lithotomy tube, to a bandage round the waist. The orifice of the instrument is shut by a plug of wood or cork, which is to be removed, from time to time, for evacuation of the urine. At first, the catheter is felt tightly fixed; and, after some time, the embrace is found to become more and more close, in consequence of the crescent inflammatory process, and its attendant swelling. The foreign body's presence is resented, in the usual way; and an effort is made for its extrusion. The temporary lodgment of a smooth metallic substance in an open mucous canal, however, does not inevitably cause true inflammation; and, accordingly, the action is generally found to fall short of this, and to follow the ordinary course of acute congestion—resolving itself by copious discharge. This occurring, relaxation and widening of the canal take place; absorption, and exhalation on the free surface, both busily conducing to this desired result; and then

the instrument—before, fixed and firm, as in a vice—will be found loose and movable. It is then withdrawn ; and a bougie, of comparatively large dimensions, may be passed in its stead. This is permitted but a brief stay ; and then the ordinary instrumentation is proceeded with, as in other cases.

This method of treatment, it is obvious, requires great care ; there being always a risk of over-action locally, as well as of untoward constitutional disturbance. And the case must be watched accordingly. There is always considerable uneasiness in the part, during the instrument's stay ; and a little excitement of the system may seldom be avoided. It is only when either proceeds to excess, that the instrument has to be prematurely withdrawn. In some patients, it may be safely retained for twenty, thirty, or forty hours ; in others, that time must be greatly abridged. Opiates are of service, in allaying the pain and irritation. And if, by their use, all untoward symptoms are averted, we need not regulate the catheter's stay by any fixed limit of hours ; but may regard its thorough loosening, as the first sign of the propriety of its removal. It is seldom that a retention of more than twenty-four hours is required. And, in that short space of time, if the case proceed favourably, we may expect three-fold more progress than under the ordinary system of management. This method, however, though rapid, is doubtless attended with some risk, which the other method wants ; and therefore is wisely held applicable only to the severe forms of stricture, on which ordinary means may have produced, or are likely to produce, but little effect.

But there are worse strictures still, to which even this treatment is unsuitable—because of their extreme tightness, and unyielding nature. An instrument cannot be made to penetrate ; and it is difficult to retain one but partially introduced. In these cases, we must be content with the treatment already noticed, of passing down a bougie, of medium size, and retaining it in contact with the stricture for some time, at the ordinary intervals ; expecting that, in this way, the desired diminution of deposit by absorption may advance. But, if excitement occur, the case becomes urgent by retention of urine ; and then we are forced to relieve the bladder. The stricture must be got through. A firm instrument, of

suitable size, is patiently and gently used—remembering that, by the inflammatory process, the parts have had their lacerability much increased. With the aid of sedatives and antispasmodics, we may succeed. But, if baffled in this legitimate use of the instrument, we are not warranted in having recourse to force. It is better to cut than to bruise and tear ; it is better to make a clean wound through which urine may discharge itself innocuously, than to leave a bruised and torn sinus in which infiltration can hardly fail to occur, with all its lamentable results. The patient is put into the position suitable for Lithotomy ; and an incision is made in the central raphé, as formerly described, (p. 490.) The bladder having been relieved, and the stricture cut through, a catheter of medium size is passed from the orifice of the urethra to beyond the seat of stricture, and is retained as long as the feelings of the patient will permit. Then it is removed ; on excitement having passed off, it is re-introduced ; and thus we endeavour to retain the canal of considerable width, while the external wound slowly closes. On cicatrization being nearly completed, the size of the catheter or bougie is gradually increased ; and the instrumentation is continued, in the ordinary way, until full dilatation shall have been completed. This is the treatment of extreme cases. To such only is it applicable. And of the skilful surgeon it is comparatively seldom required.

It has lately been proposed, to extend the principle of subcutaneous incision to the treatment of stricture. But a fatal objection to such proceedings is, the liability to urinous infiltration ; free and direct incision coming soon to be required, and that too late to save the part from loss of substance, and the system from grave disorder. Accordingly, it is understood that the practical experience of this method has proved far from satisfactory ; and, in all probability, further repetition of the experiment will scarcely be thought advisable. The risk is least, when fistula in perineo exists behind the stricture ; and when, consequently, the urine has an opportunity of draining away through the perineal opening, without coming in contact with the incised urethra situate anteriorly.

A safer method of incision is, from within the canal, by the employment of lancetted catheters. But these are dangerous weapons, very obviously, in the hands of the inexperienced; and the most skilful must have difficulty in using them with safety, in the case of stricture posterior to the bulb. There can be no certainty of the incision being made in the true direction; the walls of the canal may be injured; and then infiltration of urine can hardly fail to ensue. For very tight and unyielding contractions anterior to the suspensory ligament, however, the method is not unsuitable. The straight instrument of Mr. Stafford can be passed down, and held directly on the diseased part; and the operator can make sure of pushing onwards the cutting stilet in the right direction. After this, a common bougie may find itself but little opposed, and may pass readily on to the bladder. But even then there is always some risk of accident by escape of urine into the cut parts. And, accordingly, we would limit the use of the straight and short cutting catheter, to those cases of anterior stricture which resist the ordinary means; and would dissuade from the use of the long and curved cutting catheter, under any circumstances whatever. It is but seldom that the former will be required.

Orificial stricture—tight, callous, unyielding, sometimes admitting the most delicate probe with difficulty—is usually the result of cicatrization; and the sore has probably been of venereal origin. By probes, or short bougies, occasionally introduced, a cure by dilatation may sometimes be procured in the ordinary way. But, very frequently, it is found necessary to expedite the process by incision. A narrow probe-pointed bistoury is introduced; and, by its edge, the contracted part is notched all round. A bougie is passed immediately afterwards, of such a size as will penetrate without force. And repetition is made daily, in an ascending scale; a less interval than usual sufficing here, there being less irritability than in the deeper-seated portions of the canal. Sometimes, it may be found necessary to lay the contracted part entirely open by incision, introducing the bougie afterwards through the wound; and seeking for a cure of the

stricture, at the cost of establishing an imperfect state of the urethra, similar to the congenital malformation termed Hypospadias.

It is easy to understand how spontaneous alleviation of stricture may occur ; either by absorption, or by ulceration. But it is probable that such an occurrence is actually very rare ; and, certainly, it is not to be trusted to in practice. Relief by the latter mode, indeed, is not desirable ; inasmuch as the cicatrix of the ulcer is likely to reproduce contraction, perhaps in an aggravated form.

For a like reason, the caustic bougie has now fallen into desuetude. Its use was founded on false principles ; and its practical failure has been complete. To prove successful as an escharotic, in clearing away obstruction, the comparatively unoffending mucous membrane must first be sacrificed ; and though, for a time, ample space may be thus obtained, yet in the end recontraction is obviously inevitable ; partly by reason of the plastic deposit which surrounds ulceration, and partly by reason of the contraction which invariably attends on cicatrization of a sore. The only use of the "caustic bougie" is, not as an escharotic, but as a corrector of irritability. If a peculiarly irritable stricture resist the ordinary means, already alluded to, decided benefit may be obtained by the application of nitrate of silver, to the contracted part and its vicinity. This may be accomplished, either by the porte-caustique, recommended by M. Lallemand ; or by means of the old-fashioned instrument—a wax bougie, in whose hollowed point a portion of the nitrate of silver is imbedded. For a stricture at all penetrable, the former is the preferable instrument ; but a tight contraction can be directly reached, only by the latter mode of conveyance. It is probable that what are termed "elastic" strictures—strictures which dilate under the ordinary treatment, but speedily relapse, and become tight as before—depend on an unusual irritability of the canal ; and that they will be more appropriately treated by the occasional application of nitrate of silver—in conjunction with the ordinary use of the bougie, and suitable general treatment—than by the dangerous practice of subcutaneous section.

Urinous Abscess.

This consists in the condition of abscess, complicated with a communication with the bladder or urethra, and consequently having a greater or less admixture of urine in its contents. The formation may occur in one of two ways; from without or from within. 1. An abscess may form exteriorly to the urinary passages—excited by injury, or by the irritation of stricture or stone; and, in its progress by enlargement, it may open into the urethra, or bladder—according to its site. Then, through the ulcerated aperture, urine enters. Its stimulus, within the purulent cyst, necessarily kindles a fresh amount of inflammatory action. If this advance rapidly to ulceration of the tissues composing the limits of the original abscess, then urinous infiltration takes place, with sloughing of the affected parts. But, if the pyogenic membrane remain entire—perhaps strengthened by a renewed and sthenic exudation—then the escaped urine remains limited within the confines of the abscess, and the state of urinous abscess is established. The collection may assume quite a chronic character; but, in general, it extends more rapidly than an ordinary acute abscess, hastening to the surface, and discharging thin, dark-coloured, and foetid contents.

2. Or, as more frequently happens, the affection originates in ulceration of the lining membrane of the urethra or bladder. Acute ulceration, and also direct laceration, of the mucous membrane is liable to occur, as we have seen, in the case of retention of urine; then rapid escape of urine takes place, under powerful action of the hypertrophied muscle of the bladder; and the most formidable extravasation results. But, unconnected with any such crisis, a more gradual giving way may take place; the urine, escaping first in a few drops, may excite an inflammatory process of a sthenic type; the abscess formed has all the ordinary characters—the important limiting barrier of plastic exudation not excepted; and, as it enlarges, these are not destroyed. Before the actual ulceration, too, it is probable that an inflammatory process has been slowly advancing in the tissue exterior; which has thus become in some measure consolidated, before any urine has had an opportunity of entrance.

Or, as has already been stated, the commencement may not be by ulceration, but by wound or tear—inflicted by an unskilful use of catheters, bougies, or other instruments.

But, the term “Urinous, or Urinary Abscess,” is generally understood to refer to the urethra. Its origin is usually from within ; and the usual exciting cause is stricture. The urethral ulceration may be either immediately behind the stricture, or at some distance posteriorly. The ordinary site is in the perineum. There a hard swelling is discovered, on pressure ; the ordinary symptoms of stricture undergo aggravation ; shivering and febrile disturbance occur ; and, perhaps, by the pressure of the abscess, retention of urine may be occasioned. The treatment consists in making a free external incision, for the evacuation of matter and urine ; and in removing the cause, the stricture, in the ordinary way.

Urinary Fistula.

This may follow wound in the perineum, implicating the urethra. More frequently, it is the result of urinous abscess. The collection has opened spontaneously in the perineum, temporarily relieving the symptoms, both of abscess, and of stricture ; but, by persistence of the latter, closure and cicatrization of the abscess are prevented ; the irritation of the stricture maintains a morbid degree of excitement, and the obstruction which it occasions forces the urine into the abnormal channel. The abscess consequently does not close ; but, partially contracting, degenerates into the condition of fistula. There may be but one fistula, or several ; in the perineum, or traversing the scrotum, or anterior to the scrotum, or on the nates. Sometimes abscess burrows beneath the fascia of the penis, and opens near the glans ; sometimes the opening is on the dorsum of the penis. Also, one abscess, having more than one external outlet, may lead to the establishment of more than one fistula ; or, each fistula may be connected with a separate abscess. The discharge is thin and gleety ; often copious. Sometimes a constant dribbling of urine exists ; in other cases, urine escapes only during an expulsive effort. The surrounding parts are tender and ex-

coriated ; the patient is in a constant state of discomfort ; and very frequently his general health suffers seriously.

Treatment is simple ; directed to the stricture, not to the fistula—at least in the first instance. The stricture having been wholly dilated, the urine comes again by the normal channel ; the fistula contracts and dries ; and, in many cases, it wholly closes, without any direct treatment having been received. Should contraction prove tedious and incomplete, the hot wire may be used ; applied not to the mere orifice, but deep in the track—lest premature closure of the external part might take place, and reproduction of the condition of urinous abscess ensue ; not repeated frequently, but at long intervals—it being our object to obtain the benefit of the healing process which follows remotely on the burn, not the destructive and inflammatory effects which are its primary result, (p. 185.) If sinuses communicate with fistulæ, it will probably be necessary to lay them open with the bistoury. In cases long neglected, in which the whole urine has for years been passing by the perineum, the urethra anterior to the opening contracts greatly, and may be almost completely obliterated. Dilatation is then effected with great difficulty.

Sometimes the abscess opens, not in the perineum, but into the rectum ; and fistula forms in the bowel. Urine passes per anum, and air, or even fæces, may escape by the urethra. The treatment is the same as for the more common varieties ; the speculum ani being used to protect the bowel, when it is necessary to employ the cautery.

Laceration of the Urethra.

This has been already spoken of, (p. 487.) The first object is to prevent infiltration of urine ; and that can only be accomplished by an early introduction of the catheter, which should be retained until a sufficient time for consolidation of the injured parts has transpired. If a catheter cannot be passed, incision must be had recourse to, as already explained. But, extravasation of urine is not the only risk that demands our regard. That over, the risk by inflammatory action remains ; a minor amount is likely to cause stricture ;

true inflammation will cause abscess ; and this, communicating with the urethra, will degenerate into perineal fistula. Leeching, fomentation, rest, and antiphlogistic regimen, are therefore very essential after the injury. Neglect a severe kick or blow of the perineum, and stricture, abscess, and fistula, are almost sure to follow.

CHAPTER XXXV.

AFFECTIONS OF THE TESTICLE.

Orchitis.

THE inflammatory process affecting the testicle may be acute or chronic ; original, as following external injury ; or secondary, the consequence or attendant of gonorrhœa. Sometimes it is an accompaniment of Mumps—an inflammatory enlargement of the glands in the upper part of the neck ; not improbably depending then on a metastasis. The secondary gonorrhœal orchitis is usually acute, and is the most frequent form of the affection. It is also known as *Hernia humoralis*. There being an increased susceptibility in all the genital system, during the existence of gonorrhœa, orchitis may be lighted up at any time, by the application of a slight exciting cause ; a squeeze, excess in walking or diet, exposure to cold and wet, or premature use of strong injection. But, without any apparent exciting cause, the attack is liable to occur ; and then seldom until some time has elapsed—usually in the third week of the gonorrhœa. It may be a result of metastasis ; more frequently the action extends by continuity of tissue, descending along the vas deferens ; seizing on the epididymis, and chiefly residing there. In fact, the affection may in strict language be designated as an Epididymitis ; although the whole testicle seems to swell, yet the epididymis is the true seat of the action, and the general swelling depends chiefly on acute effusion of serum into the tunica vaginalis. Pain and a sense of weight are felt in the cord and testicle, the skin reddens, and uneasiness is felt in the

groin and loins. The swelling and pain increase, often becoming excruciating ; and then sensation in the loins is as if the back were sawn across. Discharge from the urethra diminishes, and ceases—an example, generally, not of metastasis, but of the effect of counter-irritation. The scrotal swelling becomes tense, red, glistening, and intolerant of the slightest pressure ; the cord, too, is swollen, red, and painful. The febrile disturbance is considerable ; and vomiting is both a common and distressing symptom. Sometimes such pain is complained of, in the lower part of the abdomen, as to lead to a simulation of enteritis—and for this the complaint has actually been mistaken.

Treatment requires to be decidedly antiphlogistic ; leeching, rest, fomentation, low diet, antimony. Recumbency is essential ; and the weight of the tumour must be taken off the cord, by suspension, or by the arrangement of a pillow between the thighs. Opiates, too, are of much service ; in full doses, and of frequent repetition. When the body of the testicle is undoubtedly involved in acute action, the antiphlogistic use of mercury is both warrantable and expedient ; to save, if possible, the delicate structure of the gland. If tension be great, it is well to open a vein in the scrotum ; at the same time perforating the tunica vaginalis with the lancet, so as to evacuate the accumulated serum. French surgeons have advised that the puncture should implicate the testis ; but this is not necessary, the testis seldom being so affected as to require wound for the relief of tension ; and it is inexpedient also, on account of the risk of exciting or aggravating an intense inflammatory action there, from which the patient might otherwise have been exempt. As the action subsides, resolution may be hastened by stimulants to absorption ; a solution of the iodide of potassium, with iodine, may be painted on the surface, and pushed to vesication ; at a more advanced period, a gum and mercurial plaster may be applied ; or pressure may be made by means of adhesive plaster, cut in strips, and applied as if to a limb—the testicle being separated from its fellow, and made to protrude, so as to admit of such application. By some, it is proposed to apply this pressure from the first ; but, surely, its proper place is only after the chronic stage has been fair-

ly established. In the acute stage, pressure, however carefully applied, must prove intolerable, or at least must cause aggravation, if the action be resident in the testicle itself. In the case of epididymitis, there may be a greater tolerance of the application ; but still its usefulness as an antiphlogistic is more than doubtful. As the complaint yields, discharge may be expected to reappear at the orifice of the urethra. Very frequently, resolution is incomplete ; a hardness and swelling remaining in the epididymis. This requires active perseverance in the employment of local discutients ; and the iodide of potassium is useful internally. In some cases, resolute absorption is not only rapid but excessive. The gland, after regaining the normal size, continues to diminish, and may ultimately dwindle down to a mere shred, wholly destitute of the peculiar function.

Sometimes *Abscess* forms ; but seldom, in secondary orchitis, unless some casualty or mismanagement have occurred, so as to involve the testis in true inflammation. In primary orchitis, however, the result of direct injury, the occurrence is not so rare. It is attended with much suffering ; and the tubular structure of the organ is endangered. An incision must be made as soon as matter has formed ; and, in the after treatment, care must be taken to obviate the tendency to fungous protrusion which the substance of the testicle usually manifests.

Chronic Orchitis, and Fungus of the Testicle.

Chronic orchitis may be the result of an acute attack, imperfectly resolved ; or—as more frequently happens—the action may be chronic from the first ; it also may be either primary or secondary—that is, occurring as an independent affection, or as a consequence of gonorrhœa. Very frequently, it depends on stricture of the urethra ; not unfrequently it is of syphilitic origin. The body of the testicle is completely involved, as well as the epididymis—though the latter is usually the first affected. The swelling, at first irregular, extends from the lower part of the epididymis, and involves the whole organ in a firm, inelastic, uniform tumour, usually of an oval form, and seldom exceeding twice or three times the

bulk of the healthy gland. The attendant uneasiness is slight ; and, after some time, the characteristic sensibility of the organ under pressure is in a great measure lost. The enlargement is found to depend on the deposit of a yellow, cheesy, fibrinous exudation, condensed—intra-tubular, as well as in the interposed cellular tissue. It is not vascularized ; and is probably a secretion from the tubuli themselves—like other secretions from mucous membrane, not prone to become fully organized. On making a section of the tumour, after removal, this deposit and its peculiar characters are very apparent.

Slow softening of this condensed lymph may take place ; matter is formed ; the swelling increases, with a subacute exacerbation ; the integument thins, and gives way by ulceration ; and through the opening the tubular structure protrudes, in the form of a hard, firm, light-coloured, comparatively painless, and slowly increasing fungus. The softening, in such a case, is but partial, and the amount of suppuration slight. Not unfrequently, opening and protrusion take place, apparently without the intervention of any such action ; the tunica albuginea gives way, under the gradual increase of deposit ; the tunica vaginalis becomes adherent, and ulcerates at this point ; and then the integument soon yields also. If the opening be small, the protrusion may be proportionally trifling. But, sometimes, almost the whole of the organ protrudes ; its surface studded with weak granulations, from which a copious thin secretion is discharged.

Chronic orchitis requires the ordinary discussive means for its arrest and removal ; and abstraction of the cause, when practicable, is not to be omitted. Simple enlargements of the testicle always lead to a suspicion of stricture in the urethra ; and that canal is examined accordingly. If stricture be found, it must be removed, before any amendment can be expected from treatment directed towards the testicle. When syphilis is the originating cause—indicated by the history of the case, the concurrence of other syphilitic signs, and nocturnal exacerbations of pain in the testicle—that taint must be combated by the ordinary means ; and cautious mercurialism may be required.

In the open condition, when fungus has formed, a slight

operation is necessary ; the object being to reclaim the fungus—producing absorption of the anormal deposit by pressure, reducing the swelling, and clearing the tubuli. The thickened integument around, constituting the closely adherent margin of the ulcerated opening, is loosened by dissection ; and, having been brought completely over the protrusion, is secured by suture. Consolidation takes place ; the tendency to protrusion is repressed ; and, by the contraction incidental to cicatrization, such pressure is exerted by the integument on the parts beneath, as leads to gradual removal, at least in part, of the anormal deposit. After cicatrization, such pressure may be supposed to continue, in some degree, for a time ; and is then to be aided by the discussive means applicable to the occult chronic enlargements. This is infinitely preferable to the old method of shaving off the fungus from time to time, and treating the remaining wound as an ordinary ulcer. The cure was tedious ; and, besides, frequent use of the knife in this way was tantamount to castration. By the new method—for which the profession is chiefly indebted to Mr. Syme—the cure is accelerated, and the function of the testicle is preserved. A question, however, still remains to be settled ; whether the whole of the protruded part is capable of being reclaimed ; whether the intratubular deposit will wholly disappear, and the tubes recover their normal state and function. The probability is, that, in the outward part of the fungus, disorganization has often advanced too far to admit of this ; and that, therefore, this portion may be removed by the knife, before the rest is covered in by the raised integument—without sacrificing any recoverable virile power, and with the effect of still further expediting the cure. Often, the operation cannot be performed immediately on the patient's presenting himself ; some days of preparatory treatment are usually necessary, that the part may be brought to a clean, granulating, and quiet condition—favourable to adhesive results.

Central suppuration may occur in chronic orchitis. The matter may slowly reach the surface, and be discharged. Sometimes, it remains long stationary, in the condition of chronic abscess. Then the fluid portion of the matter may be absorbed, while the solid part remains in a concrete mass, resembling tubercular deposit ; but distinguished from it, by

being confined within a distinct cyst—what was the pyogenic membrane.

Tubercular deposit is not uncommon in the testicle; occurring either in aggregated masses, or diffused in the tubular structure, which becomes atrophied under the pressure of accumulation. The affection is termed "*Scrofulous Testicle*." The swelling is gradual and very indolent; little pain or uneasiness is felt; the tumour is, at first, of irregular form, and seldom attains to a large size; and the tubercular diathesis is usually indicated, by strumous affections in other parts of the body. After a time, one of the prominences enlarges, reddens, and becomes painful; softening and suppuration have occurred there; the integument gives way, and pus and tubercular matter are discharged. The sore presents the ordinary appearances consequent on tubercular softening, (*Principles*, p. 229.) Other parts may soften, point, and break; and sinuses communicate one with another. After a time, the greater part of the tubercular matter may be discharged; then the swelling diminishes, and the sores assume a healing tendency. Should any considerable part of the tubular structure have remained entire, it may protrude and form a fungus, as in the case of simple chronic orchitis. This fungus may be repressed in the ordinary way; and solid and permanent cicatrization may occur. But, sometimes, a fistulous opening remains, discharging thin pus, and occasionally also the secretion of the tubuli; and then the condition of *Spermatic Fistula* is said to be established.

Treatment varies according to the stage of advancement. In the indolent state, discussives are employed, along with antistrumous constitutional treatment; and gradual subsidence of the swelling may result. In the softened state, incision is suitable; for evacuation. If then the amount of deposit and suppuration seem slight, cicatrization is to be attempted. If, however, as is more frequently the case, the suppuration and deposit are extensive, it is well to favour speedy disintegration and discharge of the anormal mass, by a free use of potass. Afterwards, pressure, by strapping, is of much use in favouring closure and cure. Sometimes, the tubercular matter protrudes slightly; but this fungus is readily distinguished from that which is composed of the sub-

stance of the gland, by being of less size, soft, crumbling, varying, and temporary. For the one, preservation is suitable; the other requires a destructive use of the potass. Sometimes the extent of suppuration and disorganization in the part, and the degree of disturbance in the constitution, are such as to call for more summary procedure; and, to save the system, the part has to be sacrificed, by castration.

In the indolent stage of the scrofulous testicle, and during the progress of simple enlargement dependent on chronic orchitis, it is not uncommon for serum to accumulate in greater or less quantity; masking the character of the tumour, and increasing its apparent bulk. It is detected by softness, transparency, and fluctuation. If the accumulation prove considerable, occasional removal by tapping is of use; permitting the discussive applications to act more efficiently on the solid enlargement.

Tumours of the Testicle.

These were wont to be included under the general term *Sarcocoele*. The most common, is the simple enlargement dependent on chronic orchitis. The scrofulous tumour is not uncommon. Occasionally the fibrous tumour is found. Cystic sarcoma is as frequently formed here as in any other situation. Carcinoma and cancer are not of frequent occurrence. Cephaloma has no more frequent site; sometimes, though rarely, it is combined with melanosis; and sometimes the open medullary tumour degenerates into the condition of Fungus Hæmatodes. These tumours present the ordinary characters, and require the ordinary treatment, (*Principles*, p. 541, *et seq.*) The simple enlargements are capable of discussion. The strumous tumours may be either discussed or disintegrated. The rest can be removed only by castration. Prognosis, in the case of malignant formations, may be more favourable here, than at any other site.

Irritable Testicle.

This term is usually made to include both mere increase of the sensibility of the organ, and decided neuralgia. The

former is almost always dependent on some affection of the urethra, bladder, or kidney, or on disorder of the general system ; and is to be remedied accordingly. But it may—like the tumid and sensitive breast of the female—be the temporary consequence of change at puberty ; and it may also follow mere excess in venereal excitement.

The latter is a very formidable disease ; inasmuch as it is attended with much suffering, and is but little amenable to any treatment. Uneasiness is almost constant : and violent pain comes in paroxysms. There is little or no enlargement, or other morbid indication, in the organ ; in general, it is intolerant of pressure and manipulation ; and, during the paroxysm, it is retracted close upon the groin. The patients most liable to suffer from such affections, are the weak, nervous, and dyspeptic ; more especially if they have indulged much in venereal excitement and gratification. Occasionally the affection is combined with cirsocele ; and seems to depend on that morbid condition of the veins. But, in general, the origin of the affection is equally obscure as in most other cases of neuralgia. The treatment is such as is generally applicable to this disease, (*Principles*, p. 525.) Among the more successful local applications, aconite, belladonna, and nitrate of silver may be mentioned ; among those used internally, iron, and the liquor arsenicalis. Very frequently, but little improvement follows the most skilful management ; and the patient may be driven by his sufferings to demand castration. This request is seldom if ever to be complied with, however ; inasmuch as the neuralgia is likely to return, in the cord ; being not dependent on any local cause, capable of being removed by the operation.

Atrophy of the Testicle.

A gradual wasting of the testicle may follow acute orchitis, as already noticed ; and a blow or squeeze may result in this, with the intervention of a very slight inflammatory process.* It is not uncommon for atrophy of the testicle to su-

* Squeezing of the testicles is a mode of castration in oriental courts ; complete atrophy being found to result. And the same method is applied to the lower animals ; bucks, for example.

pervene on cirsocele. The pressure of hydrocele would appear, in some few cases, to cause diminution of the gland ; and the same result has followed the pressure of fatty or other tumours. Continence, and the prolonged use of iodine internally, are supposed to tend to atrophy ; but the truth of the supposition seems more than doubtful. Suppuration of the testicle may cause disorganization of part of the tubular structure, with obstruction and consequent absorption of the remainder. Atrophy of one or both organs, it has been supposed, has followed injuries of the head. Occasionally, examples of the affection occur, and no exciting cause can be assigned.

Obviously, but little is in our power, in the way of treatment ; except by removal of the cause, when that is practicable. In the case of cirsocele, for example, if we succeed in curing this, the wasting of the testicle may be expected to cease. Restoration of the normal bulk, however, is scarcely probable.

Hydrocele.

The term denotes a chronic accumulation of serum, in connexion with the genital organs ; and it may occur in more than one site ; in the tunica vaginalis, in the cord, or in the sac of a hernia.

I. *Hydrocele of the Tunica Vaginalis Testis.*—There is no more common disease. It may follow on injury, and a minor amount of orchitis ; sometimes it is attributed by the patient to a strain ; very frequently, there is no assignable cause. Swelling takes place slowly, and with little or no uneasiness ; ascending from the lower part of the scrotum upwards. The tumour may ultimately attain to a large size, encroaching closely on the groin. It is of pyriform shape, except when much distended ; and then the narrowness of the upper part is undone by expansion there. It is translucent, unless the coverings be preternaturally thickened. Fluctuation can be felt, unless distention is great. The testicle usually occupies the back of the cavity, near the middle—nearer the lower than the upper part ; and cannot be felt distinctly. On grasping the tumour firmly at that part, however, a hard substance may be felt ; and the patient experiences the peculiar sensa-

tion which compression of the testicle is calculated to produce. Sometimes the testicle is situate in front ; and then can be felt distinctly. It is never found at the lower part of the scrotum, and separate from the general swelling, as in hernia. The finger and thumb can always be carried above the tumour, at its neck ; and the spermatic cord can be felt free. The tumour has no impulse afforded to it, on coughing, or during any other exertion of the abdominal muscles ; unless there be a communication between the cavity of the tunica vaginalis, and that of the abdominal peritoneum—as in the case of congenital hernia. The accumulation generally consists of a straw-coloured serum ; and sometimes loose solid bodies are found, as in serous cysts elsewhere. The tunica vaginalis is, in general, merely distended ; sometimes it is thickened ; sometimes it is intersected, so as to constitute minor cysts. In simple hydrocele, the testicle and epididymis are structurally sound. Not unfrequently, however, they are the subject of chronic enlargement ; and then the disease is technically termed *Hydro-sarcocoele*. (P. 571.)

The treatment of hydrocele is either palliative or radical. The former consists in simply withdrawing the fluid, by tapping ; the swelling and uneasiness are removed for a time ; but they return, and sometimes rapidly. The latter mode consists in withdrawing the serum, and injecting a stimulant fluid instead, whereby an acute congestion may be established, whose resolution, when complete, shall have the effect of restoring the normal balance between exhalation and absorption. (*Principles*, p. 156.) Simple tapping may be performed by the thrust of a lancet ; the flat end of a probe being afterwards used to keep the wound open, during the flow of serum, if necessary. Or a flat trocar and canula may be employed. When injection is contemplated, a round trocar and canula are to be preferred. The patient is placed erect. The surgeon, grasping the tumour firmly behind, with his left hand, renders it tense and prominent in front ; then the instrument is entered, perpendicularly ; afterwards it is passed obliquely upwards so as to avoid wound of the testicle, and yet taking care that the obliquity is not such as endangers separation of the coverings of the sac, and non-entrance into the sac itself. The serum having been withdrawn, a caout-

chouc bottle, with stopcock and nozzle, is adapted to the canula—or a syringe is employed ; and the cavity is partially filled with some stimulant fluid. Port wine, undiluted, or a solution of the sulphate of zinc, used to be much employed. Now, the favourite injection is iodine, in solution ; one part of the tincture to three of water. Or, a small quantity of pure tincture of iodine having been thrown in, may be permitted to remain permanently in the sac—disappearing ultimately by absorption. The ordinary method, however, proves quite effectual ; and, being more free from hazard of over-action, ought probably to be preferred in general practice. Three or four ounces of weak solution having been injected, the fluid is temporarily retained, by withdrawing the bottle, and turning the stopcock of its nozzle—which is left pendent from the canula. After waiting a few minutes, the patient will begin to feel pain in the testicle, shooting up the cord into the loins ; and a feeling of faintness will probably come upon him. Then the stopcock is opened, and the fluid drains away. The patient is put to bed, with the scrotum supported. If the action threaten to be excessive, fomentation is applied, and antimony is given internally. The tumour re-forms quickly, with heat and pain ; sometimes the acute accumulation seems greater than the first. By and by, recession in the action gradually occurs ; the tumour subsides ; the pain ceases ; and, in eight or ten days, we may expect to find the parts restored, permanently, to their normal state. It has been proposed to retap, for evacuation of the acutely effused serum, and thus to abridge the period of cure ; but this seems to be, in most cases, unnecessary.

It is very seldom that the operation fails. Should it do so, it is to be repeated, with a stronger stimulant. The method by pure tincture of iodine, allowed to remain, is then suitable.

Before injecting any stimulant, it is most necessary that the surgeon satisfy himself that the point of the canula is fully within the cavity of the tunica vaginalis ; otherwise, injection of the cellular tissue of the scrotum may take place, followed by sloughing, and severe constitutional disturbance.

A case of hydrocele presenting itself, injection cannot at

once be determined on. It is first necessary to ascertain whether the testicle is sound or not ; and this cannot be done until the serum has been discharged. If the organ be then found in its normal state, injection may at once be proceeded with. Otherwise, it must be delayed ; we are first to turn our attention to a cure of the chronic enlargement ; and, after that has been accomplished, the radical operation may then be undertaken. When the testicle is diseased, the accumulation of serum is but a symptom of this affection, and is to be treated accordingly. The palpable cause of the redundant secretion must be removed ; otherwise, reproduction can scarcely fail to occur. For, the radical cure, by injection, is not effected by glueing the serous surfaces together, and obliterating the cavity of the tunica vaginalis, as was at one time supposed. The excited action seldom advances to plastic exudation ; and the cure is simply by restoring normal function in the membrane, as already stated.

A hydrocele of large size is not at once to be injected, though the testicle be sound. It is simply tapped ; and when, by reaccumulation, an average bulk has been attained, then the radical cure is to be proceeded with.

The painful operations by seton, caustic, and incision, are now fallen into complete desuetude. Of late, it has been proposed to operate by acupuncture ; making small openings with a needle, through which the serum may gradually escape, partly externally, but chiefly into the cellular tissue—thence to be absorbed. The mode is tedious and uncertain ; but, being safe, and little painful, it may be had recourse to, when the patient decidedly objects to the ordinary treatment by injection.

Children are liable to hydrocele. And in them, treatment is very simple. We may succeed in dispelling the fluid, by discutient lotions—such as a solution of the muriate of ammonia ; or by the external application of iodine, used cautiously. Failing in this, the serum is to be evacuated by the simple puncture of a lancet. And this, in the great majority of cases, is sufficient to effect a radical cure. The part swells, reddens, and is painful, as after injection in the adult ; and, on resolution being completed, the parts are found in a normal state.

By the term *Congenital Hydrocele*, is usually understood, a condition of parts such as leads to congenital hernia ; the vaginal process of peritoneum not having become obliterated. The fluid consequently communicates with the cavity of the peritoneum, usually by a small aperture ; and may be made to disappear gradually from the scrotum, by pressure upwards. In treatment, the first object is to shut up the vaginal process ; and this may in general be effected, by the constant pressure of a truss. In the child, this may suffice for the whole cure ; absorption of the fluid being afterwards hastened by discutient applications. In the adult, the ordinary treatment may be necessary ; but never is injection to be had recourse to, until we are satisfied that all communication with the peritoneum has been completely obliterated. To obtain this result, use of the truss is also important in another point of view. The testicle is liable to injury ; by slight injuries the inflammatory process may, at any time, be lighted up in the tunica vaginalis ; and, from thence, extension to the abdominal peritoneum will be easy and direct, unless the communication have been closed.

By *Encysted Hydrocele* is understood, an accumulation of serous fluid within a cyst, or cysts, independent of the cavity of the tunica vaginalis. Such adventitious formations are usually found connected with that portion of the tunica vaginalis which covers the epididymis ; but they may arise in connexion with any part, either of that membrane or of the tunica albuginea. The growth is more irregular than in common hydrocele, and the tumour seldom attains to a large size ; the testicle is situated sometimes in front, sometimes on the lateral aspect ; sometimes at the bottom ; seldom on the back part, as in the common form ; and the fluid is generally paler and less albuminous, than that which is found in the tunica vaginalis. When the bulk is such as to occasion inconvenience, tapping is had recourse to ; and, if nothing contra-indicate, injection may be practised. Should this fail—as is not unlikely, in the case of a plurality of cysts—a seton may be introduced, and retained until consolidation has occurred.

The tunica vaginalis has been found the site of much calcareous deposit, and filled with turbid fluid containing cho-

lesterine. In such a case, cure can result from nothing short of free incision ; and, after all, castration may not improbably be required.

Lately, spermatozoa have been observed in fluid withdrawn from hydrocele, by Mr. Liston and others. It is still matter of dispute, whether these had escaped from an accidental wound or giving way of the tubular structure, either of the testicle or of the epididymis ; or whether the cyst, from which they were derived, had been formed by dilatation of a part of the tubular structure—as takes place in lacteal tumour of the breast, and in ranula. If the latter opinion prove true, as is inclined to by Mr. Liston, little benefit need be expected to result from injection in such cases.

Hydrocele and hernia may co-exist ; and, as the former enlarges, the cord and abdominal aperture may come to be so occupied and compressed as to prevent hernial descent. A hydrocele, thus enacting the part of a truss, should not be interfered with, unless productive of much inconvenience by its weight and bulk.

II. *Hydrocele of the Cord*.—This may be either diffuse or encysted. The *Diffuse* form is comparatively rare. A serous fluid accumulates in the cellular tissue of the cord, and is enclosed in a distinct cellular sheath ; this again is covered by the cremasteric expansion. The swelling is seldom of large size ; uniform, and somewhat pyramidal ; of slow formation ; and not attended with any considerable uneasiness. The base rests on the point where the spermatic vessels join the testicle, and is separated from the tunica vaginalis by a dense septum ; hence, the testicle is felt, distinct, in its ordinary site. If the abdominal aperture be not encroached upon, there can be no difficulty in diagnosis ; but, when the swelling extends within this, it is apt to be mistaken for omental hernia. The chief points of difference are, the completeness in reduction of the hernia, the clearness of the cord after reduction, and the impulse given upon coughing ; in the hydrocele, also, fluctuation is in general tolerably distinct. The fluid has been found reducible within the abdomen, but not into the abdominal cavity ; passing up along the spermatic cord—probably in its cellular tissue—and, when past the abdominal ring, forming a distinct tumour in the abdominal parietes. Un-

less the swelling prove large and inconvenient, it need not be interfered with. The best mode of cure, probably, is acupuncture, aided by local discutients. The punctures are made at the lower part of the tumour, and need not be numerous: for the fluid readily escapes from cell to cell; and, not unfrequently, these are broken down into larger compartments.

The *Encysted* hydrocele of the cord is the more common variety. The serous fluid is contained within a distinct cyst; sometimes of adventitious formation; sometimes formed of an unobliterated portion of the vaginal process of peritoneum. Growth is slow and painless. The tumour is circumscribed, oval, tense, and fluctuating; often plainly translucent; always movable on the cord. The testis is felt distinctly separate. And no difficulty in diagnosis exists, unless, as sometimes happens, the swelling extends within the abdominal parietes. In general, however, the tumour can be pulled down from the abdominal aperture, permitting the cord to be felt free above; and, besides, the tumour can never be wholly reduced within the abdomen—a certain degree of tense fullness always remaining in the upper part of the canal. In the child, this affection will disappear under discussives. In the adult, it seldom demands interference. If it should, it may be got rid of by tapping and injection; or a seton may be temporarily applied.

III. *Hernial Hydrocele*.—When a scrotal hernia has been reduced, and the neck happily becomes obliterated, the sac, remaining, may become filled by serous accumulation. A pyramidal, fluctuating, and translucent tumour will result; of easy diagnosis; and amenable to the same treatment as an ordinary hydrocele. The affection is of rare occurrence.

IV. *Hydrocele in the Female*.—The term Hydrocele is applied to an œdematous state of the round ligament; analogous to diffuse hydrocele of the cord in the male. A prolongation of peritoneum, along the round ligament of the uterus, may remain in communication with the abdominal cavity, by means of a narrow aperture at its neck; and this pouch may become the seat of serous accumulation, constituting a tumour analogous to congenital hydrocele of the male. Also, the round ligament is liable to be the seat of cystic formation; analogous to encysted hydrocele of the cord

in the male. The affections are rare ; and seldom require active treatment.

Hæmatocele.

This may be the consequence of external injury ; or it may be of spontaneous occurrence. By the term is understood, an accumulation of blood, in one of three localities ; the cellular tissue of the scrotum, the cellular tissue of the cord, and the tunica vaginalis.

1. *Hæmatocele of the Scrotum* is the result of bruise, or oblique wound ; and is analogous to an ordinary bruise, both in nature and in treatment. The scrotum swells, and is discoloured ; the hue is blackish, like that of urinous infiltration ; but the diagnosis is easy, by attention to the history of the case—also noting that there are none of the signs of gangrene present, and that the system is comparatively unaffected. The treatment consists in arresting inflammatory action, and afterwards favouring absorption of the extravasated blood by local sorbefacients. Incision is withheld, unless suppuration have unfortunately occurred.

2. *Hæmatocele of the Cord*.—A spermatic vein may give way, under external injury, or great bodily exertion ; and extravasation into the cellular tissue will result, forming a tense, discoloured tumour there. The treatment is as for the preceding variety.

3. *Hæmatocele of the Tunica Vaginalis* is the most common form ; and to it, in strict accuracy, the term may be limited. The blood is extravasated into the cavity of the tunic ; and may be associated, or not, with hydrocele. By wound of the testicle, in tapping—or by a blow or other external injury, or by the spontaneous giving way of a blood-vessel—a hydrocele may at any time be converted into hæmatocele. The tumour suddenly increases in size, and is the seat of pain ; and, when handled, it is found heavier, and less fluctuating than before. The blood, if in small quantity, becomes diffused in the serous fluid ; when in large quantity, a portion coagulates, and assumes the fibrinous arrangement. This, acting as a foreign substance, may excite inflammatory action ; and suppuration may take place, with much increase of swelling and pain.

When hæmatocele is unconnected with hydrocele, the treatment is as for other simple extravasations—antiphlogistic and sorbefacient; the formation of matter being the only indication which requires use of the knife. When the extravasation supervenes on hydrocele, simple tapping is in the first instance to be had recourse to. To inject then, would be productive of no good result; and, very probably, would cause over-action and suppuration. The fluid is allowed to collect again; and tapping is repeated. After several withdrawals, the fluid may be found once more of the same characters as in simple hydrocele; and then injection may be proceeded with, not only in safety, but with a good prospect of success. In the confirmed cases—and more especially when suppuration is already threatened—the only mode of obtaining a radical cure is by free incision; laying the cavity fully open, turning out the coagula, and obtaining closure of the gap by granulation; especial care being taken to avoid wound of the testicle. If the tunica vaginalis be found thickened, and otherwise much altered, the greater portion may be cut away; as thus the amount of suppuration, and the period of cure, will be materially abridged.

Cirsocele.

A varicose condition of the veins of the spermatic cord is termed Cirsocele, or Varicocele. The pendent nature of the part predisposes to this affection. And the ordinary causes are such as favour varix in general; especially constipation, and laborious exertion in the erect posture; as also, tumours, trusses, and whatever causes obstruction to upward flow in the cord. The left side is much more frequently affected than the right; the left testicle usually hanging lower than the right; and the left spermatic vein being not only longer in its course, but also more exposed to compression by fæcal accumulation in the sigmoid flexure of the colon. The swelling is usually pyriform; with its base on the testicle, its apex upwards; and, on manipulation, the veins can be distinctly felt rolling under the fingers, like cords or earth-worms. There is a sensation of weight and uneasiness in the part; the testicle may be the seat of neuralgia, sometimes it be-

comes atrophied. An aching sensation in the groin and loins is not unfrequent. Sometimes the swelling proves very inconvenient, from its mere pendulousness and bulk; as in saddlers and others, who require close approximation of the thighs in their vocational labour—and in those who are much on horseback. Occasionally, a mental despondency is observed, greater than the bodily ailment would seem to warrant.

Treatment is palliative or radical. The former consists in avoiding or removing the more obvious causes of the affection, keeping the testicle well supported by a bandage, and bathing the parts frequently in cold water. When the integuments of the scrotum are very redundant, the testicle may be retained in close contact with the groin, by invagination of the loose integument through a padded metallic ring. Or such trussing may be more effectually maintained, by removing the redundant skin by incision; support of the testicle being then intrusted to the cicatrix.

When the testicle is suffering either by neuralgia or by atrophy, or when much uneasiness and discomfort are experienced, eradication of the disease is naturally sought for. With this view, the varix is to be treated here as elsewhere—by obliteration of the veins. 1. The actual cautery may be used; a heated wire being applied to the veins, isolated and fixed between the finger and thumb. The practice is safe and effectual, but the pain and formidable nature of the application are serious objections. 2. The veins may be compressed by suture, applied on needles passed beneath them by transfixion; as in ordinary varix, (*Principles*, p. 488); care being taken to exclude the vas deferens and the spermatic artery. Obstruction of the duct is tantamount to castration, obliteration of the artery can hardly fail to be followed by atrophy of the testicle. 3. The operation of M. Vidal may be performed. The varicose veins, having been separated from the rest of the cord, are placed between two silver wires, passed by the transfixion of needles, and emerging at the same openings. By twisting together the ends of the wires, the interposed veins are compressed; and, by a continuance of the twisting, they are rolled up round the wires, while at the same time the testicle is somewhat elevated.

The ends are then secured, on a roll of bandage placed on the integument. By further twisting of the united ends, by means of a turnstick, the compression and twisting of the veins are gradually increased; and this is continued, until the wires free themselves by ulceration—thus declaring section and obliteration of the veins to be complete. 4. Obliterative pressure may be maintained on the veins at the groin, by means of a spring truss. But this is the most objectionable of the modes of cure.

A variety of varicocele occasionally occurs, affecting the veins within the inguinal canal, and at the groin; while those of the scrotum are comparatively free. It is very liable to be mistaken for hernia, as formerly noticed. The best test is, the peculiar sensation imparted to the finger and thumb when the part is pinched and rubbed. Palliative treatment suffices. Should a radical cure be sought, the preferable means—in this case—is the application of pressure by a truss.

Tumours of the Cord.

Occasionally, adipose tumours form in the cellular tissue of the spermatic cord. Their bulk is inconvenient, and their pressure may cause atrophy of the testicle. They are to be removed by incision. Fibrous tumours, and osseous formations, have also been found here; but are rare.

Castration.

This severe and painful mutilation is seldom required, except for tumours of the testicle; malignant, or such as, though simple, are not amenable to either discussion or disintegration. In neuralgia of the testis, and in cirsocele, it is sometimes demanded by the patient; but in neither case is the surgeon warranted in acceding to the wish.

All hair having been removed from the scrotum and groin, the patient is placed recumbent. By grasping the tumour behind, the skin is made tense. The bistoury is entered at the neck of the swelling, and carried to its fundus; diverging over the body of the tumour, so as to include a sufficiency of skin within an elliptical incision. This form of

wound is especially necessary, when a fungus, ulcer, or other involvement of the skin requires removal. A simple rectilinear wound would suffice for removal of the tumour ; but a redundancy of skin would be left, constituting a pouch for untoward accumulation of blood or pus. On the other hand, it is very necessary to avoid excessive removal of the skin, lest, on contraction, a bare sufficiency be found for effectually covering the remaining organ. And, in connexion with this, it is important to remember, that the covering of a large sarcocele is borrowed from the adjoining parts ; and that, consequently, after incision, a great degree of resilience in the integument is certain to occur. The dissection is advanced, first at the upper part of the wound, so as to expose the cord ; this, having been isolated, is intrusted to the firm grasp of an assistant, to prevent retraction within the abdominal aperture ; and then it is cut across. The apex of the tumour being now everted, dissection is rapidly proceeded with—a dissection rendered comparatively painless and bloodless, by the early section of the cord. Care is taken not to wound the septum, and thus to expose the sound testicle. The arteries of the cord are then tied. And, should they have slipped from the fingers of the assistant, an upward enlargement of the superficial wound may be required. The scrotal vessels are secured with especial care ; experience telling us that, otherwise, troublesome bleeding after reaction is almost certain to occur. The wound is brought together, and treated in the ordinary way. The lower part seldom heals but by granulation ; and, therefore, need not be closely approximated. The cord requires to be carefully watched ; diffuse suppuration being apt to occur there ; and should this threaten, early incision must be had recourse to. But, by suitable antiphlogistic precautions, all necessity for a resumed use of the knife may generally be avoided.

It is important to remember, that, like hydrocele, sarcocele may co-exist with hernia ; and that the latter may be temporarily restrained by the bulk of the tumour of the testicle. On removal of this, however, the hernia, descending during the cries or straining of the patient, may appear at the wound.

Impotence.

This may depend on imperfect development of the testis ; but not on imperfect descent. The organs are as efficient, functionally, in the abdomen as in the scrotum. Ablation and atrophy of both organs cause impotence ; but either testicle may be lost with comparative impunity. The oxalic diathesis, and diabetes, diminish the sexual appetite and power ; and so does the phosphatic diathesis, to a less degree. The pressure of hydrocele may cause impotence, even without atrophy of the testicle. Affections of the brain are sometimes followed by it. In the newly married, a temporary loss of power is sometimes caused by mere predominance of mental motion. Excessive venery, inducing a very irritable state of the whole genital system, is perhaps the most frequent cause.

Cure can be expected, only in those cases which are unconnected with structural change in the testicles. The cause having been removed, certain medicines are supposed to have a tendency to restore this animal function, and are hence termed Aphrodisiacs. Of these, the most important are, Indian hemp, conium, and phosphorus ; the two former most suitable in cases of irritability ; the latter given, in very guarded doses, for the more chronic examples. Musk, cantharides, steel, and other tonics, may also be of service ; and diet should be generous. The mental cases may be left to work their own cure.

Spermatorrhœa.

An irritable state of the testicles, seminal vesicles, bladder, and urethra, with a turgid and especially irritable state of the prostatic portion of the urethra, leads to involuntary and frequent emission of the seminal fluid. By much the most frequent cause of this morbid condition is masturbation ; and, next in order, comes excess in venereal indulgence. Stricture, prostatic diseases, and irritation communicated from diseased rectum, are common causes of minor forms of the affection. In consequence of the irritability, an impression much inferior to the normal stimulus suffices for production of seminal discharge. Slight venereal excitement, by day or

night, causes emission ; and semen is also discharged during straining at stool, and by the effort of evacuating the last drops of urine in micturition. The testicles are soft, and hang low in the scrotum, which is loose and flabby. Impotence results ; by incapacity of erection, as well as by reason of preternatural haste in emission, and the vitiated character of the secretion itself. The digestive organs become deranged ; the general health fails ; many anomalous sensations are felt, and many serious diseases are simulated ; a dejected expression of countenance is acquired ; and the air and bearing are those of a poltroon.

The principles of treatment are obvious. Chastity in thought, word, and deed ; cold bathing, and a tonic system of treatment ; avoidance of purgatives, or other sources of local irritation and general exhaustion ; cheerful society, and healthful occupation of body and mind. If the irritability continue, nitrate of silver is to be applied to the posterior part of the urethra, by means of the porte-caustique of Lallemand.* This instrument having arrived at the tender part—which is at once indicated by the feelings of the patient—has the stilet projected, so as to expose the caustic ; and, by gently turning the instrument from side to side, an efficiency of application is ensured. Afterwards, strict rest, with antiphlogistic regimen, must be maintained ; and, if need be, sedatives are given, either by the mouth or by the rectum. Repetition may be required, after an interval of some days. In mild cases, the occasional introduction of a common metallic bougie, may succeed in removing the irritability ; rendering recourse to the more painful and hazardous cauterization unnecessary. Cold enemata, and counter-irritation in the perineum, may be of service. Compression of the urethra, by a pad applied to the perineum, has also been found useful.

* This instrument “consists of a straight or curved platina canula, or tube, rather smaller than a middle-sized catheter, through which plays a caustic holder ; in the further extremity of which there is a narrow groove, eleven lines in length, for the purpose of holding the caustic. After filling the groove with the nitrate of silver, by fusing it over a spirit lamp, it becomes so securely fixed, that there is no longer any danger of it escaping. At the other end there is a sliding screw or stop, by which the action of the remedy may be limited to any extent less than the groove which contains it. Another sliding stop affixed to the canula serves, after the distance of the orifice from the part to be cauterized has been ascertained, to prevent the instrument passing further into the canal.”

CHAPTER XXXVI.

AFFECTIONS OF THE SCROTUM AND PENIS.

Erysipelas of the Scrotum.

ERYSIPELAS not unfrequently attacks the scrotum, in a distinct and marked form ; peculiarly asthenic in its type ; partaking much of the characters of diffuse cellular infiltration. It occurs in adults of a weak and broken down system, given to drink and other dissipation ; and usually follows a kick, blow, or other injury. Swelling is great and rapid ; with marked symptoms of constitutional irritation from the commencement. Thin, unwholesome matter speedily forms, and is diffused into the cellular tissue. The skin—at first, red, tense, and glistening—blackens, or assumes a tawny hue, shrivels, and becomes cold and foetid. Sloughing is begun and advancing. Very frequently, the groins are involved ; and the mischief extends upwards in the abdominal parietes. The constitutional symptoms soon pass from the irritative into the typhoid type ; and fatal sinking follows. Local and general safety can be obtained, only by early and active interference ; free incision, and constitutional support, (*Principles*, pp. 288 and 304.)

Erythema may occur at any time in the scrotum, under the ordinary exciting causes. It follows the ordinary course, and requires the ordinary treatment.

The cellular tissue of the scrotum is very liable to œdema ; occurring sometimes as a distinct affection ; much more frequently a concomitant of general anasarca. When excessive, relief and diminution may be obtained by the making of a few dependent punctures ; made cautiously, however, lest asthenic and diffuse inflammatory action ensue.

Elephantiasis of the Scrotum.

The scrotum is liable to chronic enlargement by hyper-

trophy ; forming a large, simple tumour, within which the genital organs come to be altogether concealed ; the prepuce alone remaining visible, at the lower part of the swelling, thickened, and warty ; and from this point the urine is discharged, in a scattered stream. The affection is much more frequent in hot climates, than in this country. There is no cure, but by use of the knife. When the tumour is of small size, the incisions may be planned so as to save the penis and testicles ; and the dissection is conducted cautiously with this view. In the case of a large tumour, however, such an attempt is hazardous ; the patient being apt to undergo fatal exhaustion, under the tedious and painful operation, and the copious loss of blood. It is then better to sacrifice every thing ; and to effect removal, at once, by a few rapid strokes of a long bistoury. Before proceeding to any operation, however—and more especially to summary ablation—it is most necessary to ascertain whether or not scrotal hernia exist. If such be found, the incisions must be planned and conducted with peculiar care.

Chimney-Sweepers' Cancer.

The integuments of the scrotum are liable to malignant ulceration ; more frequently found in chimney-sweepers than in others—probably on account of the irritation of soot, and habits of uncleanness ; but not limited to that peculiar vocation. The ulcer begins in the form of a wart ; and frequently is surrounded by warty formations. It may spread rapidly. Cure is only by excision ; and certainty of success is to be hoped for only at an early stage—when the disease is as yet limited to the integument, and when no great amount of even this tissue is involved. At a more advanced period, when the testicle is exposed, and probably contaminated, a chance may yet be afforded by castration ; provided the groins are free from secondary enlargement, and the constitution is not much broken down.

Priapism.

Permanent erection of the penis occurs in three forms.

1. From injury of the spine. This has been already noticed, as a distressing symptom of spinal fracture. 2. From vascular and nervous excitement, induced by excessive venereal stimulus. The turgescence may be such as temporarily to occlude the urethra, causing retention of urine; and this is to be treated by antiphlogistics and antispasmodics, as formerly noticed. 3. A more formidable variety may occur, from the same cause as the preceding; dependent on extravasation of blood into the corpora cavernosa—a vessel of some size having given way. In a case of urgency, it may be necessary to evacuate the extravasated blood by incision; but, in general, it is better to treat the case according to the general principles applicable to bruise; averting inflammatory action, and favouring absorption. If incision be made, there is great risk of troublesome suppuration following; incapacitating the organ afterwards for normal erection.

Phymosis.

Phymosis and Paraphymosis both depend on preternatural contraction of the præputial orifice; the difference being, that in the one case the contracted portion occupies its normal position in front of the glans; in the other, it is reflected behind the glans, and acts as a constriction there, on the body of the penis.

Phymosis may be congenital; an original malformation. In this case, if the contraction be great, the child is apt to suffer much. The urine escapes imperfectly; and, in consequence, a chronic balanitis may ensue, or a calculous concretion may form. In after life, the præputial contraction may have the same effect as a tight stricture of the urethra; causing first irritability of the genito-urinary system, afterwards organic disease—stricture of the urethra, change in the coats of the bladder, dilatation of the ureters, and finally renal involvement. Should these dangers pass by, and an advanced age be reached by the patient, ulceration is apt to take place at the contracted part; and, very frequently, the ulcer assumes ultimately a malignant action, and extends so as to involve the glans and body of the penis. It is import-

ant, therefore—on many accounts—to remove this source of evil as early as possible.

The acquired form of the affection may be acute or chronic. The acute is the result of an acute inflammatory process ; following external injury ; or sympathetic with gonorrhœa, balanitis, or venereal sores. The cellular tissue becomes infiltrated with serum ; the swelling, thus caused, prevents the glans from being uncovered in the usual way ; and discharge, accumulating, aggravates the disorder. The main treatment is by rest, fomentation, poultice, and general antiphlogistics. And, under this management, swelling may more or less rapidly disappear, and the normal state be regained. Failing this, and if there be urgency for exposure of sores—which may be extending rapidly, and may require activity in direct applications—incision is necessary. It may be that the urgency is such as to demand incision very early in the case, while the sores are yet fully impregnated with virus ; and then there is great risk of the disease being much extended, by contamination of the recently made wound. Such risk may be in a great measure obviated, however ; by applying an active escharotic immediately to the sore, so as to annihilate the local poison, and the poisoned part ; and by touching the wound slightly with the nitrate of silver, so as to make a protecting crust on the raw surface. In general, the operation is to be delayed, until the sores are of such a date as to render impregnation of the wound at least improbable—the reparative stage having been reached, when discharge probably ceases to be virulent.

The chronic form of acquired phymosis may result from a gradual increase of congenital formation, or from cicatrization of ulceration or wound. It, like the congenital form, is to be relieved only by operation. And this may be performed in various ways.

1. A simple and very suitable mode consists in inserting a director into the præputial cavity, retaining it by the side of the frænum, introducing on it a sharp-pointed curved bistoury, and by this transfixing and dividing the prepuce at its lower aspect. The director's point must in the first instance be moved about freely, to make sure that it is in the præpu-

tial cavity, and not in the urethra. The site of the incision is chosen, for very obvious reasons. If placed on the dorsum, two unseemly flaps are formed, and the glans is left permanently uncovered. By the side of the frænum, a less amount of wound suffices; the glans is equally well exposed; and, after cicatrization, no unseemliness results, nor is there any departure from the normal relative position of the parts. To prevent resilience of the integument from the mucous membrane, and thereby to prevent an unnecessary extent of raw surface, a fine suture on each side is required; and this is retained, until it is spontaneously freed by ulceration, or until consolidation has taken place by plastic exudation—whereby the natural resilience is obviated. 2. When the prepuce is redundant in front of the glans, the following operation is suitable. The prepuce having been stretched, so as to clear the glans, the mere orifice is taken away, by the stroke of scissors or a knife. Circumcision, in fact, is performed; to a limited extent. The skin is then found free enough, but the mucous membrane is still tight; and this is, consequently, slit up, by scissors, at two or more points. The end of each flap of mucous membrane is then secured, by a fine suture, to a corresponding portion of the integument. This mode of procedure is well suited to those cases, which are connected with a cluster of venereal sores on the very verge of the prepuce; both diseases being got rid of at once. It is also advisable when, in any case, the end of a long prepuce is much indurated, or otherwise permanently altered in structure.

Paraphymosis.

A tight præputial orifice, reflected behind the glans, and permitted to remain there, constricts the body of the organ, and gives rise to very unpleasant consequences. The superficial cellular tissue swells greatly, on each aspect of the stricture; the glans swells; and an acute inflammatory process is kindled, under unfavourable circumstances—the strangulated parts being obviously ill provided with a power of resistance or control. There is the same necessity for speedy relief, as in the case of strangulated hernia, so far as the preservation of structure is concerned; and relief is sought in the same

way. Reduction generally is practicable, in recent cases. The patient's trunk having been steadied, the surgeon grasps the glans with the fingers of the right hand, and makes steady pressure thereon, also pushing it steadily from him ; at the same time, with the fingers of the left hand, he draws forward the constricting orifice ; the object being to push the glans, diminished by pressure, through the narrow præputial orifice. The proceeding is painful ; and not at all warrantable in advanced cases.

Failing in this, and there being no marked urgency, another mode of reduction may be attempted. The penis is placed erect, and on the glans a stream of cold water is maintained for some time. This may have the effect of so diminishing the bulk of the formerly turgid part, as to admit of its being replaced without much difficulty within its præputial covering. But should these attempts at simple reduction fail, or should the case be already so far advanced as not to warrant their being practised, incision is required. And little more than a scratch suffices, if rightly placed. The general bulge behind the glans is not to be widely laid open ; but it is separated, by means of the fingers, into its two component parts. In the depth between, the constriction is found, as a narrow band or thread ; and that alone requires division. After reduction, the wound seems a mere notch in the præputial verge.

When paraphymosis and venereal ulcer of the glans co-exist, there is an especial necessity for immediate relief ; otherwise, acute phagedæna, or sloughing, cannot fail to supervene. It may happen, in such cases, that the constriction has been slight, and of old standing ; and that, in consequence, even after extensive incision on the dorsum of the penis, reduction is found impracticable ; the parts being firmly glued to their anormal site by plastic exudation. Under these circumstances, we must be contented with simple relief of the stricture, by suitable incision ; leaving restoration of normal relative position to be effected, when resolution of the inflammatory action has become complete.

Hypospadias.

This term denotes an imperfect condition of the urethra, at or near its orifice ; the result sometimes of accident or disease, but usually a congenital malformation. There may be a vestige of the normal opening at the apex of the glans, the urethra terminating somewhere behind this ; or, as more frequently happens, the anterior portion of the canal—to the extent of an inch or more—appears as if slit up, the margins of the wound having become rounded off ; in other words, the lower part of the walls of the canal is deficient. In extreme cases, the whole outward part of the urethra may be thus imperfect. The inconveniences of the affection are, a scattered and ill-projected stream of urine, perhaps inefficient emission of the seminal fluid, and a raw, congested state of the exposed mucous membrane. When there is rather a slitting up, than a deficiency of parts, the edges may be pared and brought together over a catheter. When the parts are actually deficient, autoplasty must be had recourse to ; a portion of integument being borrowed from the neighbouring perineum or scrotum, and engrafted into the hiatus. In the minor cases, however, which constitute a decided majority, no interference is necessary ; the inconveniences, if any, being slight.

Hyperspadias, or Epispadias.

This is an analogous, but opposite state ; the splitting up having taken place on the dorsal aspect. The chasm may extend from the glans to the symphysis pubis. In general, there is a sufficiency of parts to admit of paring the edges, and approximating them by suture over a catheter. Immediate union is not likely to occur at every part ; but permanent closure may ultimately be obtained, either by repetition of the operation at the unclosed points, or by occasional application of the heated wire.

Imperforate Urethra.

A congenital malformation, in this respect, is obviously to

be remedied in but one way ; by the plunge of a round trocar and canula, in the proper direction ; and by keeping the artificially constructed canal pervious, by the lodgment of a catheter—changed occasionally to prevent calculous adherence.

Malignant Disease of the Penis.

This is found only in the aged ; and, very frequently, as already stated, it may be traced to the irritation of congenital phymosis ; beginning in the præputial orifice, by ulceration, and extending thence to the body of the organ—or, it may be, beginning in the glans itself. The glans is enlarged and indurated ; angry ulcers penetrate it in various places ; the body of the penis suffers likewise ; the lymphatics on the dorsum swell and harden ; the glands of the groin are involved ; retention of urine may ensue, by pressure of the secondary tumours on the neck of the bladder ; the cachexy advances ; and the patient perishes—his end perhaps hastened by hæmorrhage from the open and deep cancer.

Nothing but the knife can afford a chance of cure. When the prepuce alone is affected, its removal is sufficient. Sometimes a malignant ulcer attacks the integument of the body of the penis, originating there ; it may be long and successfully resisted in its advance, by the dense fibrous fascia which invests the organ subintegumentally ; and, in such a case, removal of the affected surface by dissection may suffice. When the glans and body are involved, nothing short of amputation of the entire thickness affords a prospect of cure—cutting in sound parts, between the disease and the symphysis pubis ; and the attempt is warrantable, only when, as yet, the lymphatics show no sign of involvement. When the glands are already enlarged, there is nothing left in our power but palliation ; and, as formerly stated, puncture of the bladder above the pubes may be required, towards the close of the case, on account of retention of urine.

Amputation of the Penis.

This is had recourse to on account of malignant disease, affecting the body of the organ ; but only when there is a

sufficient space of sound texture between the disease and the pubes, and when the glands yet show no sign of contamination. The ordinary mode of performance is exceedingly simple. The organ, stretched by the left hand pulling it outwards, is lopped off by one sweep of an ordinary amputating knife—laid upon the part, and moved rapidly across from point to heel. The integument is encouraged to contract towards the pubes ; so that, during the puckering of cicatrization, it may not overlap and interfere with the orifice of the urethra. And this is kept of the normal calibre, by a suitable use of bougies.

Ricord's method of operating is preferable, being well calculated to obviate the principal difficulty ; namely, tendency to contraction in the orifice of the urethra. Rapid healing of the wound is also promoted ; and, at the same time, a sufficient covering is provided for the corpora cavernosa. The procedure is conducted thus : After amputation in the ordinary way—enough skin being left to cover the corpora cavernosa, and no more—the surgeon seizes with forceps the mucous membrane of the urethra, and with a pair of scissors makes four slight incisions, so as to form four equal flaps ; then, using a fine needle, which carries a silk ligature, he unites each flap of membrane to the skin by a suture. The wound heals by the first intention ; adhesions form between the skin and mucous membrane ; and these textures become continuous—a condition analogous to what is observed at the other natural outlets of the body. The cicatrix then contracting—instead of operating prejudicially, as in the old method—tends, on the contrary, to open the urethra.

When, in the case of a short stump, inconvenience results from inability to direct the stream of urine properly, and in a sufficiently outward jet, the deficiency of the organ may be temporarily compensated, by the use of a mechanical adaptation—a funnel-shaped canula, of sufficient length, its base resting on the pubes.

CHAPTER XXXVII.

AFFECTIONS OF THE FEMALE GENITAL ORGANS.*

Vaginal Fistula.

OF this there are three varieties: Vesico-vaginal, Urethro-vaginal, and Recto-vaginal; all the result, usually, of accident in parturition. By an unskilful use of instruments, the parts are torn; or, they are unduly compressed by the child's head, and sloughing consequently ensues.

Vesico-vaginal Fistula denotes an anormal communication between the vagina and bladder. During parturition, the child's head is jammed; and retention of urine occurs and is neglected. Sometime afterwards, sloughs come away, resembling portions of washed leather; if the retention have not been previously relieved, a gush of urine follows; and, afterwards, a constant draining away of that fluid remains. The patient is in constant discomfort, and her presence may be noisome to others; the vulva becomes congested and excoriated, by the constant trickling of urine; and the general health is more or less impaired. As the chasm closes, the discharge diminishes. In some cases, spontaneous closure may be complete. In the great majority, an aperture remains; sometimes small and fistulous, sometimes large and patulous; sometimes such as will barely admit a common director; sometimes a loathsome chasm, admitting several fingers. The aperture usually is in the mesial aspect, immediately behind the origin of the urethra. It can be felt by the finger; and is disclosed by the speculum—a flat copper spatula being used to hold aside the rugæ of the vagina, if need be. The existence of this anormal state of things does not necessarily prevent re-impregnation.

Treatment is palliative or radical. The former consists in taking measures calculated to prevent the constant and involuntary discharge of urine; the latter implies an attempt to

* The affections included in this chapter are considered very briefly; the great majority belonging to the exclusive province of the obstetric practitioner.

close the anormal aperture of communication. It is quite possible to dilate the vagina; to lay hold of the injured part by a stout volsella, and to bring it down to near the external orifice; to pare the edges of the opening by a bistoury; and to effect approximation by suture, by means of such instruments as are employed in *staphyloraphé*. This can be done, with difficulty to the operator, and pain to the patient; but a successful issue is extremely improbable. And so discouraging has been the result of such attempts hitherto, that most surgeons are agreed in the propriety of treating all cases of severe Vesico-vaginal Fistula by palliative means alone. The minor cases are remediable by simpler procedure; the occasional use of a heated wire. The part is exposed by the speculum; the cautery is accurately applied to the aperture; and, at long intervals, the application is repeated. The judicious operator, who wisely seeks only the remote, cicatrizing, and puckering effect of the burn, will seldom, if ever, make the interval shorter than three weeks; and often a much longer period may be found advisable. At the same time, all avoidable exertion is abstained from, the recumbent posture is maintained as much as possible, the vagina is temporarily occupied by a sponge or other plug, cleanliness is much attended to, and the marital use of the parts must be utterly abstained from. Mere fistulæ are quite curable in this way. And in the case of any opening, not of larger size than what is barely sufficient to admit the end of the little finger, cure may be thus attempted.

Palliative treatment consists in the use of the adjunctive means just mentioned; occupying the vagina by a restraining plug; attending to cleanliness; preventing filth, foetor, and excoriation. Probably the best means of occupying the vagina is, by a pyriform caoutchouc-bottle, of moderate size; enveloped in a piece of oiled silk; introduced in a state of collapse, and then inflated by means of a nozzle and stop-cock—or by means of such a valve as is used in air-tight cushions. Thus accurate compression is made on the aperture, so as to prevent escape of urine; and both comfort and cleanliness are obtained. The bottle is withdrawn daily, the air being previously permitted to escape; at the same time, the vagina may be cleared of accumulated secretion by means of a

syringe, and foetor may be removed by a solution of the chlorides ; and the bottle, having been cleaned, is replaced.

Immediately after the occurrence of the accident, something may be done to favour spontaneous contraction of the aperture, and perhaps spontaneous cure. The patient is directed to lie as much as possible on her face ; a catheter is constantly retained—being changed only for the purpose of being cleaned ; a sponge is placed in the vagina, of sufficient size to exert a moderate closing pressure on the injured part ; and the bowels are kept gently open, so as to preclude the necessity of straining.

Urethro-vaginal Fistula denotes a preternatural communication between the vagina and the urethra ; caused, probably, by the imprudent use of instruments. The same disagreeable results occur as in the former case. The treatment is the same.

Recto-vaginal Fistula.—Laceration of the septum between the vagina and the bowel takes place, by the rash use of instruments, or by tearing in the natural efforts of parturition. In the latter case, the perineum usually suffers laceration also. The parts are to be kept clean and quiet ; and spontaneous diminution of the chasm is favoured by every possible means. When the fistulous condition has been arrived at ; that is, when the margins of the tear have healed, and contraction has ceased—the parts are exposed by means of a speculum, the edges are made raw by paring, and approximation is effected by means of the quilled suture, (*Principles*, p. 609.) The parts, in this case, being comparatively superficial, the operation is performed not only with comparative ease, but also with a good prospect of success.

Laceration of the Perineum.

This, too, is a casualty of parturition ; the parts tearing down towards the anus—perhaps with implication of the bowel, as we have just seen. The wound is kept clean, and approximation is effected by adduction of the thighs. By and by, the healing process is stimulated by medicated water-dressing. The fissure, in general, entirely heals. If not, then the unclosed portion, having had its edges made raw by the

bistoury, is brought together by means of the quilled suture—the form of suture found most suitable, in almost all cases of solution of continuity in these parts. Suture in the recent state of the injury is quite improper.

Abscess of the Labium.

This may occur, at any time, from external injury. In prostitutes, it is often unconnected with any apparent exciting cause. Pain and swelling are considerable. The pus, if left to itself, effects spontaneous evacuation, by a ragged aperture in the mucous membrane, on the vulval aspect of the swelling. This should be anticipated, by a free incision in the same locality. The matter possesses an intense and peculiar foetor.

Noma.

This term is applied to sloughing phagedæna, attacking the vulva; constituting a disease, similar in its nature, progress, and treatment, to Cancrum oris, (p. 190.) The patient is generally an adolescent, of impaired general health, badly fed and clothed, and a stranger to cleanliness.

Malignant Ulcer of the External parts.

Malignant ulcer occasionally shows itself on the mons veneris, or neighbouring parts. A wide removal by means of the knife, at an early stage, is the only remedy; the orifice of the urethra being saved, if possible.

Tumours of the Labia, &c.

In the Labium, fatty tumours are the most common; easily removable by the knife. In the after treatment, regard must be had to prevention of erysipelas; which, otherwise, will be very liable to occur. Simple enlargement sometimes takes place in one labium, or in both; constituting a tumour analogous to the Elephantiasis Scroti of the male. And a hypertrophy of another kind is not uncommon; commencing as warty excrescences, of venereal origin; and ultimately at-

taining to large size. These tumours are also removable by the knife ; but smart hæmorrhage is to be expected.

Encysted tumours occasionally form ; when of small size, removable by incision, and evulsion of the cyst ; when large, to be dealt with by regular dissection. Hernial tumours, be it remembered, are also met with in the labium ; recognizable by the ordinary signs, and amenable to the ordinary treatment. Varicocele is also common in this situation. Large thrombi, or ecchymoses, sometimes occur suddenly during labour, and may require to be incised.

Hypertrophy of the Clitoris and Nymphæ.—These parts are liable to simple enlargement. Ordinary cases require no remedial interference. But it may happen, that the swellings are not only inconvenient by their bulk, but also of a suspicious character as regards malignancy ; and, in such circumstances, removal by the knife may become necessary.

A red fleshy excrescence in the orifice of the urethra is productive of intense suffering, on account of extreme sensibility of the part. It is seldom of large size ; and is usually at the verge of the canal, partially projecting. The only remedy is by excision ; or by simple ablation, followed by the use of an escharotic to repress growth. During healing of the wound, the nitrate of silver is of much use in restraining inordinate sensibility ; applied lightly, every alternate day.

Uterine and Vaginal Polypi.

Polypi in this situation are usually firm and fibrous, and of a pyriform shape. They are much more frequently connected with the uterus than with the vagina ; growing from the interior of the organ, and usually projecting into the vagina, more or less, through the os uteri. Very frequently, they are covered by an expanded continuation of the mucous lining of the uterus. Bearing down pains are complained of ; there may be menorrhagia ; there is always more or less vaginal discharge, generally copious and fœtid, and sometimes bloody ; and the general health suffers seriously. On examination with the finger, the foreign body is encountered ; and, by feeling the os uteri encircling its neck, it is distinguished from a protrusion of the uterus itself. Removal may

be effected either by ligature or by the knife. The tumour is firmly laid hold of by means of a stout volsella, and brought down as near to the external orifice of the vagina as possible. Its neck may then be tightly ligatured, and, by knife or scissors, amputation may be made on the distal side of the deligation. Or, it may be impossible to bring the parts sufficiently low to admit of such manipulation, and then the ligature may be applied by means of a double canula ; as in the case of firm nasal polypus, (p. 161.) But modern experience seems rather to prefer simple amputation of the growth, in most cases ; trusting to plugging of the vagina, for arrest of hæmorrhage.

Stricture of the Vagina.

This is the result of the inflammatory process ; perhaps advanced to suppuration and ulceration. Under ordinary circumstances, it is amenable to the same treatment as contractions of other mucous canals. But the surgeon's aid is seldom called for, except during the crisis of parturition ; the progress of the child having become obstructed, by an unyielding contraction of the vagina—usually situated at the upper part of the canal, and usually the result of a previously unfortunate labour. The duty of the surgeon is, by a probe-pointed bistoury, introduced on the finger, to notch the contracted part at various points ; and then, by his fingers, to effect rapid dilatation.

Obliteration of the Vagina, to a greater or less extent, has occasionally been met with ; the result of unfortunate labour. Then, much constitutional disorder must result, from arrest of the uterine discharges ; and it is desirable to restore the canal, at least to such an extent as to admit of a due performance of the excretory functions of the organ. The knife, or the trocar, is used, guided in a normal direction by the finger in ano ; and the passage made is kept dilated, by means of tents or bougies.

Foreign Bodies in the Vagina.

These may be introduced by the patient herself, under some morbid excitement ; or, violently and criminally, by a second

party. And they may be of such bulk, or so impacted, as to resist the ordinary means of extraction. By dilatation and lubrication of the passage, and by the judicious use of forceps or lever, dislodgement may be effected, without injury of the parts. In difficult cases, division of the sphincter may possibly be necessary ; as in the analogous case of the rectum.

Abscess between the Vagina and Rectum.

Matter may form here spontaneously, or in consequence of the application of external violence. If the pus accumulate in large quantity, it may threaten an irruption into the general peritoneal cavity. Relief and safety are obtained by an evacuating puncture from the rectum.

Vaginal Cystocele.

This term denotes a hernial protrusion of the bladder through the parietes of the vagina ; constituting a tumour there, which is apt to be mistaken for prolapsus of the uterus. Pregnancy and parturition are its predisposing causes. Sometimes the descent is slow and gradual ; sometimes it is sudden, with a sensation of something having given way, pains in the loins, and threatened syncope. A soft, reducible tumour, covered with transverse rugæ, is presented, behind which the neck of the uterus can be felt in its normal state ; the direction of the urethra is altered ; and more or less suffering takes place in micturition. The treatment is by pessaries, and recumbency. The best pessary is a piece of sponge, covered with oil-silk.

Imperforate Vagina and Hymen.

The vagina may seem well formed externally ; but, on examination, may be found terminating in a blind *cul de sac*, at no great distance from the orifice. In such a case, no exploratory incision is warrantable, in search of the uterus, in the adult ; unless, on careful examination, by the rectum and otherwise, there is a tolerable certainty of that organ being present.

A more frequent imperfection occurs at the orifice ; the

other part of the canal being well developed, and in a normal state. The membrane of the hymen may be excessive, and imperforate ; or the vagina itself may be shut up, by a more solid and fleshy structure. Interference is not necessary, and, indeed, the malformation may not be discovered, until about the time of puberty ; and then, on account of non-appearance of the menstrual discharge, and the persistence of uneasy sensations in the pelvis and parts affected, attention is directed to the state of the genital organs. The obstructed fluid may be found bulging through a thin membranous septum ; or there may be but a vestige of the normal opening, and solid flesh beneath, devoid of bulge or fluctuation. In the one case, simple division of the membrane suffices to establish the normal state. In the other, careful incision is required, as in the case of imperforate anus ; and the same necessity exists, for afterwards maintaining the proper calibre of the part, by suitable means. Immediately after incision, it is well to ensure thorough evacuation of the pent-up fluid ; washing out the vagina, by means of a powerful syringe.

Not unfrequently, adhesion of the nymphæ takes place in children ; the opposed surfaces having become raw, on account of neglect of cleanliness, or in consequence of these parts suffering in sympathy with disorder elsewhere, and a purulent discharge having become established. In general, the cohesion is slight, and easily broken up by means of the flat end of a probe. For some days, interposition of dressing is necessary, to prevent reunion.

Affections of the Uterus.

Prolapsus Uteri is a frequent casualty among child-bearing females ; relaxation of the parts, and laborious avocations in the erect posture, conducing directly thereto. The state of inversion of the organ may, or may not, be co-existent. Tendency to such displacement may be prevented, and a normal state quite restored, by careful and timeous attention to posture and exercise, by local and general tonics, and by the wearing of a supporting pad on the vulva. The confirmed and complete cases are palliated, by use of the various pessaries. Lately, a more radical cure (?) has been proposed, by what is termed *Episioraphy* ; making the labia raw by

incision, uniting them by suture, and thus endeavouring to obtain occlusion of the vagina ; leaving only space enough for outward escape of the uterine excretion. Or, by application of the cautery to the upper part of the vagina, adhesion at that part may be attempted ; and thus a more effectual barrier to descent may be obtained. It is very questionable, however, how far such severe measures are warrantable.

The Neck of the Uterus is liable to be affected by simple tumescence, by simple excoriation and ulceration, by simple inflammatory induration and enlargement ; and is also occasionally the seat of warty or "cauliflower" excrescences. Disease there is detected and scrutinized, by means of the finger and speculum ; and is treated, according to its nature, by recumbency, leeching, lotions, nitrate of silver, escharotics, or the knife. A strictured state of the cervix, fatal to fecundity, may be remedied by the cautious use of a bougie.

Carcinoma affects this organ, not unfrequently. It presents the ordinary characters, both local and general ; the former being ascertainable by the use of the speculum. And it follows the usual course ; sooner or later degenerating into open cancer, and advancing in its incorrigible destruction of texture, with discharge, pain, and constitutional cachexy. The cervix uteri is first attacked ; and, while the disease is yet limited to that part, removal by the knife may be attempted. At a more advanced period, operation is now deemed unwarrantable. A favourable case presenting itself, the operation is performed thus :—The patient having been placed in a position somewhat similar to that of lithotomy, the os uteri is laid hold of by means of a strong and large volsella, and pulled downwards ; by means of a knife or scissors, the diseased part is cut away ; and hæmorrhage is restrained by plugging the vagina. Obviously, strict accuracy in diagnosis is required ; lest a simple induration of the cervix, readily remediable by simple means, should be subjected to an unnecessary severity of treatment.

Fibrous tumours frequently form in the substance of the uterus. They are irremediable. Extirpation of the uterus, in whole or part, within the pelvis, has no longer a place in the approved list of surgical operations. But, when the organ is completely *inverted*, then its removal is not

only easy, but may, with ordinary caution, be effected with safety—if such a proceeding should seem expedient, on account of the degree of attendant distress.

The passing of the Female Catheter.

In this operation, much delicacy is required. When, from prolapsus uteri, or other causes, there is much change of relative position, ocular inspection may be necessary. But, in ordinary cases, all is done by touch alone, under the dress or bed clothes. The forefinger of the left hand is placed on the orifice of the vagina; the catheter is placed over this—and, by moving the point upwards, in the mesial line, it slips into the orifice of the urethra. Or the movement may be reversed; the forefinger being placed on the clitoris, at the commissure of the nymphæ; and the catheter being moved downwards on the urethra. By the latter mode, however, the instrument is apt to pass the urethra, and to enter the vagina. Or, the finger, having been passed to the commissure of the nymphæ, is moved down in search of the urethral orifice; which is recognized by feeling a depression, with an elevation on its vaginal aspect; and, along the finger, the catheter is then directly introduced. When there is displacement of the parts, a common elastic catheter may be found more suitable than the silver instrument; as then there may be both twisting and elongation of the canal. The ordinary silver catheter should be flat, very slightly curved, and about six inches in length.

CHAPTER XXXVIII.

OPERATIONS ON THE BLOOD-VESSELS OF THE LOWER EXTREMITY.

The Aorta.

Compression of the Aorta may often be of service in cases of pelvic hæmorrhage; assisting both Nature and the surgeon in their hæmostatic means. And it can be readily effected

by direct compression of the vessel against the vertebral column—a little above, and to the left side of the umbilicus—when obesity, abdominal tumour, or intestinal distention, do not interfere.

Deligation of the Aorta is very seldom required of the surgeon. Spontaneous obstruction of the vessel, doubtless, has occurred, in a few cases, without serious consequences ensuing. But this event is very different from the abrupt mechanical obstruction by ligature; and, besides, the ligature cannot be applied without the infliction of a most hazardous wound. From the operation, a permanently successful result cannot be expected; it must we fear be regarded as inevitably fatal. But circumstances may, notwithstanding, occur, such as warrant its performance, with the object of protracting existence for a few hours; saving the patient, perhaps, from death by the direct effect of hæmorrhage, and affording an opportunity for the arrangement of temporal affairs; yet inspiring no rational hope of ultimate recovery. The vessel may be reached in one of two ways; directly, by incision through the abdomen; or indirectly, on the outside of the peritoneum, by extension of such a wound as is suitable for deligation of the common iliac. Were there a chance of successful issue, the latter method, though the more difficult, would certainly be preferred. But, as it is, the direct mode is likely to be adopted, by any one who may unfortunately find himself compelled, by a sense of duty, to undertake so unpromising and serious a procedure. The bowels having been opened by a warm purgative, so as to void both their gaseous and their solid contents, a suitable incision is made in the mesial line, commencing above the umbilicus, and terminating a little below it. The intestines are carefully pushed aside, the peritoneum is again cut through, the vessel is exposed, and a ligature is applied.

Aneurism of the Abdominal Aorta, itself, is obviously remediable only by general treatment. (*Principles*, p. 465.) The affection is simulated by great anormal pulsation in the course of the vessel, in the nervous, hysterical, dyspeptic, and anæmic. It is known, by distinct perception of a tumour, which is not movable; by observing that the tumour pulsates equally in all directions; by pulsation

and bruit being limited to this one part of the vessel, not diffused equally along its course ; and by the pulsation being constant, not occasional and intermittent.

The Iliacs.

On account of inguinal aneurism, and aneurism affecting the common femoral artery—also on account of hæmorrhage not otherwise repressible—the *External Iliac* may require deligation. Due systemic preparation having been made, the patient is placed recumbent, with the abdominal parietes relaxed by position ; and the surgeon proceeds to operate, with the intention of securing the vessel without injury of the peritoneum. Many forms of incision have been proposed and followed. That of M. Lisfrane is exact, and suitable ; exposing the vessel readily enough ; not calculated unnecessarily to weaken the abdominal parietes ; and, at the same time, causing little risk to the spermatic cord and artery, or to the circumflexa ilii artery and vein. The knife is entered, two lines above, and an inch within, the anterior superior spinous process of the ilium ; and, being carried downwards, the incision is terminated at an inch above the level of the spine of the pubes, and about an inch and one third on its external aspect. By cautious dissection, the abdominal layers are divided ; the fibres of the transversalis muscle—pinched up with forceps—being cut with extreme caution. The transversalis fascia is then scratched through, with the point of the knife—near the upper abdominal aperture, where the cord enters the inguinal canal, and where this fascia may be expected to be especially distinct, as well as loosely connected ; and, the finger having been introduced through the aperture, the rest of the fascia is divided on the finger, in safety. The peritoneum, separated from this fascia, is pushed aside ; and is held out of the way, either by the fingers of an assistant, or by means of a flat copper spatula. The inner border of the psoas muscle is traced with the finger ; and, by its pulsation there, the artery will be detected. The vein is found on the inner side, and is cautiously separated by the finger nail, or by the point of the knife ; the artery is then more fully isolated, by the same means ; and the aneurism needle is passed on the

inner side—being inserted between the artery and vein. The wound is managed in the ordinary way ; and, by position of the trunk and limbs, abdominal relaxation is maintained.

This operation is, in general, easily performed ; unless when great obesity is encountered ; and is, perhaps, the most successful of its class. In aneurism, the point for securing the vessel must necessarily vary, according to the bulk and site of the tumour.

The Internal Iliac may require deligation ; on account of aneurism of, or hæmorrhage from, its branches. Bleeding from deep perineal wounds, for example, may not otherwise be restrained. And in the cases of false aneurism of the gluteal or ischiatic arteries, this operation is usually considered preferable to direct incision of the tumour. The securing of the vessel, however, is attended with a great amount of both difficulty and hazard ; and, fortunately, is but seldom required. The patient having been placed as before, an incision is begun over the upper abdominal aperture, and carried upwards, as in the line of the former incision, to the extent of three, four, or five inches ; the extent varying according to the contemplated depth of the vessel, and always leaning rather to the side of unnecessary amplitude. The comparative length of the external wound, intrinsically, will have but little effect on the success of the operation ; and yet it has a most important bearing thereon, according as it facilitates, or impedes, the accomplishment of exposure and deligation. The abdominal muscular layers having been cautiously cut through, the transversalis fascia having been divided, and the peritoneum having been pushed aside, the sacro-iliac articulation is sought for ; and there the vessel will be found pulsating, in close connexion with its vein, and perhaps with the ureter also—both of which parts are to be avoided carefully. The origin of the vessel is nearly opposite the centre of a line, drawn from the anterior superior spinous process of the ilium to the umbilicus. Very frequently, the external iliac—first found—will prove the best guide to the internal. Isolation is effected by the finger-nail, or by the end of the needle. It is not safe to use the knife's point, at such a depth. The vein, situated posteriorly, is especially cared for. The wound being then fully opened by assistants, the needle is passed, from

within outwards ; taking care to avoid the ureter and peritoneum internally, and the external iliac vessels externally ; and selecting the point of deligation at a suitable distance from the iliac bifurcation.

The Common Iliac may require deligation, on account of either aneurism or hæmorrhage implicating the external and internal iliac arteries ; or on account of secondary hæmorrhage after high amputation in the thigh. It is reached by an incision similar to that just described ; and is, perhaps, both a more easy and a more promising operation than the preceding. The vein is found on the inner and posterior aspect of the artery, on the left side ; behind and exterior to the artery, on the right.

A similar incision, extended upwards, may serve, as already stated, for deligation of the Aorta.

The Femorals.

Aneurism of the Common Femoral, as already stated, requires deligation of the external iliac. False aneurism may form in the superficial femoral ; and, for this, the ordinary operation for such an accident is requisite ; namely, incision of the sac, and deligation of the artery above and below the wounded part. Aneurismal varix, too, is occasionally met with here, of traumatic origin ; a penetrating wound having been inflicted by the grasping of a knife, or other sharp-pointed instrument, between the thighs. It seldom gives such trouble as to demand other treatment than support of the part by bandaging.

Popliteal Aneurism is probably the most common of all external aneurisms ; and, hitherto, the Hunterian application of ligature, to the superficial femoral, has been the only approved mode of treatment. Latterly, however, as formerly explained, (*Principles*, p. 457,) the application of pressure, instead of the ligature, has been proposed. And experience is, almost daily, giving direct and undoubted testimony to the efficacy of the practice. There are some patients, doubtless, who may prove intolerant of pressure ; and there may be others who prefer the apparent certainty of the knife and ligature, to the apparent uncertainty and delay of the com-

pressor. But the vast majority of cases are assuredly capable of cure by pressure properly applied ; without risk, with but little pain or inconvenience, and without any wearisome amount of privation or confinement. The skin, which is to bear the pressure of the instrument, is protected by a layer of thick soap-plaster ; and that, again, may be covered by leather. And more than one compressor is used ; or, at least, pressure is made at different parts, at different times ; so that the burden of it may not all be thrown on one point, but, by being subdivided among several points, may be rendered much more tolerable. Using several instruments, along the course of the vessel in the thigh—they may be slackened and tightened alternately ; or the same instrument may be shifted in its site, with a like effect. It is never to be forgotten, that all severity of pressure is unnecessary ; that it is not essential that it should be such as to arrest the arterial flow, at the compressed point ; that, on the contrary, consolidation of the aneurism is more likely to take place, when a slow, and gentle, and feeding circulation remains. And it is also important to remember, that should this mode of treatment fail, it by no means interferes with subsequent performance of the ordinary operation, but, on the contrary, renders its success all the more probable. Those surgeons who adhere to the old operation, may adduce, as their reason, a series of successful cases so treated. But this is very plainly a contracted view of the subject ; and as well might such practitioners prefer amputation of the hand to amputation of a finger, for a simple affection of the latter only. A surgeon of the olden time, who had succeeded in curing several successive cases of popliteal aneurism by amputation of the thigh, might very naturally entertain a distrust and dislike of the proposal to treat the same disease by ligature of the femoral ; but the naturalness of such an aversion to the minor and modern practice, would not render it one whit the more reasonable or praiseworthy. And an impartial observer will not consider any one justified, in subjecting his patient to serious risk of life, by hæmorrhage, suppuration, and gangrene ; while he has it in his power to effect cure by a minor means, wholly devoid of risk, and the failure of which will not militate against a subsequent recourse to the major procedure—if ne-

cessary. Why should a mode of treatment, which causes no risk, always be passed by; or why should an operation always be had recourse to, which may, and not unfrequently does, result in direct loss of life? And the question comes in much force, if it be admitted—as by and by it probably must be admitted, if not already—that the two methods are at least equally successful for the cure of aneurism.

But should a case occur, suitable for deligation—on account of intolerance or failure of pressure, or on account of an express wish and preference by the patient—the operation is performed as follows:—The patient is placed recumbent, with the upper part of the thigh suitably exposed. He is directed slightly to adduct and raise the thigh, so as to make the inner edge of the sartorius salient; and, along this, the superficial femoral is traced. An incision of two or three inches in length is then made, in the course of the vessel; so placed, that its centre may correspond to the part of the vessel where it is intended to place the ligature. By cautious dissection, the common sheath is exposed; and, very carefully, this is opened, and the arterial coats isolated, to the requisite extent. In the external wound, the saphena vein is avoided; in the deep dissection, avoidance of the femoral vein cannot too prominently occupy our regard. The needle is passed very cautiously, so as to avoid all injury to the vein; which is situated posteriorly, and may be partly seen bulging out on the inner aspect of the artery. The point usually chosen for deligation is, where the vessel is crossed or concealed by the sartorius; sufficiently removed from the profunda, as a cross branch; and not too distant from the aneurismal tumour.

In performing this operation, the surgeon should always make sure, that the tightening of his ligature has a satisfactory effect on the tumour; for there is the same risk of a high division here, as in the case of the humeral artery; and, consequently, two parallel vessels may require ligature.

After deligation, a relaxed position of the limb is maintained, for obvious reasons.

For aneurism affecting the lower part of the femoral artery, a similar operation may be required. For aneurism of the superficial femoral, in its upper part, the *Common Femoral*

may be tied. But this vessel is obviously very unfavourably circumstanced for successful deligation ; and, in consequence, the equally simple, and infinitely more certain operation, on the external iliac, is to be preferred. In recent wound of the common femoral, however, with or without the formation of false aneurism, the ordinary rules of surgery are to be upheld ; the part is cut directly into, and each orifice of the wounded vessel is secured. The femoral vein, here on the pubic side of the artery, is carefully avoided.

The Popliteal.

For aneurism, or for bleeding, in connexion with the posterior tibial, the Popliteal artery may be tied ; but ligature of the superficial femoral, below where it is crossed by the sartorius, is a preferable operation. For wound of the popliteal itself, however, ligature of that vessel is necessary, according to the general principles of surgery. The patient having been secured in a prone position, a free incision is made, traversing the popliteal space, and penetrating through the skin, cellular tissue, and fascia. The deep dissection is continued cautiously, along the borders of the semi-tendinosus and semi-membranosus muscles. On the edge of the latter muscle, the artery may be felt beating ; perhaps overlapped by it. The vein is superficial, and somewhat external to the artery. The nerve is both on a more superficial plane, and on the exterior of the mesial line. The vessel is most readily exposed and secured in the upper part of its course.

The Tibials.

These vessels may require ligature, on account of recent wound, or on account of false aneurism formed at some part of their course. For secondary hæmorrhage, ligature of the femoral is to be preferred ; when recourse to an operation of this kind is deemed expedient.

Ligature of the *Posterior Tibial*, at the upper part of the leg, is an operation of great difficulty. Two methods are recommended. One consisting of a direct incision on the vessel, through the centre of the gastrocnemius and solæus ; the

other reaching the vessel from the lateral aspect. The latter is usually preferred. The limb having been placed on its outer side, a free incision is made between the edge of the tibia and the border of the gastrocnemius; the tibial origin of the solæus is then divided; and, the deep fascia having been cut through, the artery will be found, about an inch from the tibia, between the concomitant veins, and with the nerve on its fibular side. Separation of the veins is made very carefully, while the edges of this deep wound are as much retracted as possible by means of copper spatulæ; the knee being bent, and the foot extended, so as to relax the muscles of the calf. The needle is passed from without inwards.

At the lower part of the leg, the vessel is reached much more readily; by making an incision on the inner side of, and parallel to, the tendo Achillis, through the two layers of fascia; opening the sheath, separating the artery from its concomitant veins, and applying the ligature in the ordinary way.

At the ankle, the operation is also simple. A semilunar incision is made on the inner side of the malleolus, about a finger's-breadth distant from it; indeed, the finger, applied behind the malleolus, may be a sufficient guide to the knife. The fascia of the leg having been divided, a strong aponeurosis is exposed; this having been cautiously cut through, the common sheath is found; and, the vessel having been separated from its concomitant veins, the needle is passed from the heel towards the ankle, to avoid the nerve which is situated between the artery and the tendo Achillis.

The Anterior Tibial may be tied, either at the upper or at the lower part of the leg. The superior operation is difficult. A free incision is made between the extensor communis digitorum and tibialis anticus; and it is well to make a slight transverse division of the investing fascia, at each extremity of the wound. The foot is flexed. The relaxed muscles are separated down to the inter-osseous ligament; and, on this, the artery will be found. In the middle of the leg, the artery is placed between the tibialis anticus and the extensor proprius pollicis.

At the lowest part of the leg, a less incision is necessary;

the vessel being much more superficial. The wound is made on the fibular side of the extensor proprius pollicis. The venæ comites, and the anterior tibial nerve, are carefully excluded from the ligature.

Should it seem necessary to secure the vessel on the instep, by regular dissection, it is found by an incision on the fibular side of the tendon of the extensor proprius pollicis.

The *Peroneal artery* may be exposed, by a free incision on the posterior and tibial aspect of the fibula. It is found concealed under the inner edge of the flexor longus pollicis.

Deligation of the arteries of the leg, however, being seldom if ever required except on account of recent wound implicating them, all rules for regular dissection may be in a great measure dispensed with ; the extent and form of incision depending very much on those of the wound already existing, and the bleeding point being the best guide to the injured vessel.

CHAPTER XXXIX.

AFFECTIONS OF THE JOINTS OF THE LOWER EXTREMITY.

Morbus Coxarius.

THE hip-joint is liable to the common diseases of articulations ; but, from its position, the exciting causes of synovitis affect it but little, comparatively. It is a common seat of porcellaneous deposit, interstitial absorption, adventitious deposit, and other chronic structural changes. It is sometimes affected by neuralgia, also ; and then is constituted the true *Coxalgia*—a term, which, like its analogue *Omalgia*, has been improperly applied to structural change. But the most important as well as the most common affection to which this joint is liable, is chronic disorganization of the head of the bone ; to which the term *Morbus Coxarius* is applied.

There is every reason to believe, that the morbid changes usually observe the following sequence. Interstitial absorp-

tion takes place in the cancellated tissue of the neck of the bone ; perhaps with deposit of tubercular matter in the opening texture. After a time, a chronic inflammatory process is kindled ; and softening and disintegration ensue, affecting chiefly that part which is immediately beneath the articulating cartilage. The cartilage is then involved ; partly by ulcerative erosion, partly by necrosis of patches. Matter then is effused into the synovial capsule ; and acute disintegration is established. The cartilage perishes more and more ; the head of the bone crumbles down ; the acetabulum is secondarily involved in similar decay ; the joint fills, and is reduced to the condition of abscess ; the matter makes its way, more or less rapidly, and at one or more points, through the restraining textures ; corresponding pointing takes place, followed by evacuation ; and then, either the work of disintegration may advance with a fresh and fatal energy, or a lull may be experienced, and ankylosis may ensue. Such we believe to be the ordinary course. But the diseased action may occasionally commence, or at least be cotemporaneous, in the acetabulum.

A more rapid and acute destruction of the joint may follow inflammatory action primarily affecting the synovial apparatus. But the term morbus coxarius is, in strict accuracy, limited to the chronic, and gradually nascent affection, which commences in the hard textures.

The disease is conveniently divided into two stages. The first, the period which is occupied in the incipient change of structure ; without such loss of substance as to cause change of form, and with the synovial capsule yet entire ; denoted by apparent elongation of the limb. The second, corresponding to loss of substance, change of form, and destruction of the joint ; indicated by the limb's shortening and distortion. The affection is most common in the young, more especially in those of strumous habit ; and it may, or may not, be connected with some external injury as its exciting cause.

The primary symptoms are deceptive. They are such as may attend on dentition in childhood, or on general disorder of health in adolescence ; they may simulate rheumatism also ; and they are every day mistaken for primary affection of the knee. Obscure pains are felt in the knee and thigh, and oc-

casionally in the hip. The limb is weak, and its weakness is complained of—increasing with exercise ; it is felt to be long as well as weak ; it is dragged, rather than moved, in walking ; in standing, it is somewhat advanced, while but little weight is borne on it ; and all these symptoms are most observable, during fatigue consequent on exercise. An inspection, with the body naked from the waist, is essential. The knee, in which, for some time, great and almost constant pain has been complained of, may be found quite of a normal appearance, and also tolerant of manipulation. The affected limb is found decidedly thinner, softer, and more shrunk in appearance than the sound one, and somewhat advanced in position ; resting on the toes and ball of the foot, with the heel raised from the ground. To bring the two heels together requires an effort, with a suitable inclination of the pelvis ; and the effort usually causes aggravation of the uneasiness. As, in the analogous affection of the humerus, the shoulder is flattened by wasting of the deltoid ; so here is found a flattening of the hip, by wasting of the glutei. The fold between the nates and thigh—deep and almost transverse in the normal state—is sloping, superficial, and sometimes almost effaced. Place the patient recumbent ; straighten the spine, and equalize the position of the pelvis as much as possible—and elongation of the limb will be observed ; the knees and heels by no means corresponding. Part of this elongation, no doubt, is apparent only—from a twisting of the spine and pelvis, which it is impossible altogether to undo ; but much of it is real—dependent on relaxation of the ligamentous apparatus, and on increasing accumulation of fluid within the capsule, while as yet no change of form has occurred in the bone ; and also in part dependent on the comparative, or even actual, disuse of that limb, in bearing the weight of the body during the erect posture. The foregoing symptoms, however, may almost all be found in the delicate adolescent, without disease of the hip. And a further examination is necessary for diagnosis ; by jarring the joint suspected. Forcible abduction of the thigh causes pain in the hip ; so does rotation of the limb ; and a still more distinct sensation follows concussion, applied either directly or indirectly—by striking the knee, or

the sole of the foot, or the trochanter-major, smartly. There is also tenderness of the groin, and behind the trochanter.

Thus far, the disease is capable of complete cure; the limb being left of its normal length, and restored to its normal form and capabilities. But, too frequently, the morbid process advances. Pain and tenderness increase; and swelling of the hip becomes more and more apparent. The thigh becomes more and more flexed on the pelvis. A bulging is observable behind the trochanter; and this bone seems displaced somewhat backwards. Enlargement also may form over the groin; and the swellings may be felt to fluctuate. Opening and evacuation ultimately take place; with one of the two results already stated.

In this, the second stage, shortening of the limb is observed; the toes resting on the ground, without any advancement of the limb. As the shortening advances, the toes may not reach the ground at all; but, turning inwards, may dangle over the opposite member, as in dislocation. Or the toes may be everted, as in fracture of the neck of the thigh bone. And it is supposed that comparative destruction of the acetabulum tends to inversion, while comparative destruction of the head of the bone favours eversion of the foot. This shortening is plainly symptomatic of structural change in the joint; destruction of hard tissues as well as soft, deepening of the acetabulum, and abridgment of the head of the femur. And, towards such shortening, a spastic action of the muscles of the hip, no doubt, contributes somewhat. The hip appears more and more broad and prominent; though really flat and wasted; the apparent enlargement depending on atrophy of the rest of the limb, with twisting of the pelvis. As disorganization advances within, the joint becomes more and more loose; and dislocation may occur, by muscular action alone—without the intervention of a fall or other injury. The dislocation is usually upwards, on the dorsum of the ilium; and this event is of course followed by increase of shortening in the limb, and by a still greater and more marked deformity of the hip. Matter, in general, continues to form; and is evacuated at various points; at the groin, behind the trochanter, in the thigh. Not unfrequently, perforation of the

acetabulum takes place ; and then the matter may accumulate within the pelvis, fatally ; or, it may again make its way outwards, through the sciatic notch, and discharge itself at some part of the hip or thigh ; or, evacuation may take place by the rectum. Structural change may advance from bad to worse ; the patient perishing of hectic. Or, ankylosis may take place ; the patient recovering with a stiff joint, and a shrunken and deformed limb. In the case of dislocation—by no means of frequent occurrence—it sometimes happens that morbid action ceases, and the head of the bone acquires a new recipient cavity on the dorsum of the ilium. More frequently, however, the head of the bone seems to act as a foreign body in its new site, and causes much excitement.

Acute affection of the synovial apparatus in the hip—by some termed the Acute form of Morbus Coxarius—shows the ordinary characters of synovial disease. Rapid and uniform swelling of the hip ; acute pain in the hip, thigh, and knee, much increased by movement and pressure of the hip ; the thigh is bent upward, by spastic action of the muscles ; and, very often, an apparent shortening of the limb is to be observed, dependent on twisting of the pelvis ; acute fever attends ; walking, and even the erect posture, are impracticable ; often, the slightest movement, even during recumbency, is attended with great agony. If the action be not speedily arrested, suppuration takes place ; the matter is discharged, by one or more openings ; and extreme articular disorganization too frequently results, with corresponding involvement of the system. Such a case is met by the ordinary treatment adapted to acute synovitis, (*Principles*, p. 368.) Not unfrequently, the affection is of rheumatic origin.

The chronic disease, or true morbus coxarius, is also amenable to the general rules of practice. But, as already stated, it is only in the first stage that complete cure and restoration to health can be hoped for. The disease cannot be opposed too soon ; consequently, tact and experience are of much value, in enabling the practitioner to detect with certainty the obscure and insidious commencement. The paramount indication is rest ; one, however, which it is often very difficult to maintain effectively. The patient must be wholly confined

to the recumbent and semi-erect postures ; the weight of the body must not, for an instant, be felt by the affected limb. And the best way of accomplishing this, is to put the patient to bed, and keep him there ; the parents and attendants having been previously enlisted in the cause, by having the importance of the privation fully explained to them. Should the patient prove refractory, a light splint may be applied, as for fracture of the neck of the bone. And by some, indeed, the wearing of this splint is recommended throughout the whole period of cure, in order to oppose the decided tendency to flexion of the thigh which invariably exists—increasing along with the disease. But, probably, relief is obtained by this spontaneous assumption of posture, as in analogous affections of the knee-joint ; and, to thwart Nature in this, were to denude ourselves of an important item of the means of cure. Encourage, rather, the flexion, until the disease has begun to subside ; and then undo it gradually, ere rigidity has occurred.

A few leeches are applied over the hip—perhaps with repetition, should heat or pain seem to require this ; and then moderate counter-irritation is maintained, by inunction of croton oil, or tartar emetic. If the tubercular cachexy be suspected, the suitable opposing constitutional management is put in force. And by steady perseverance in such treatment, for some weeks, all symptoms of disease may subside ; the patient may rise, without any feeling of local ailment ; and, cautiously renewing the use of the limb, he may find, in due time, all its functions fully restored. But, if the disease threaten to advance, recourse to a higher degree of counter-irritation is necessary ; the actual cautery is to be applied behind the trochanter ; or a seton may be placed, either there, or in the groin. Rest and moderate counter-irritation were enough, for the period of absorption ; but, when structural change, by chronic inflammatory results, has fairly begun, the highest grade of counter-irritation is demanded.

In the advanced period of the second stage, all severity of treatment is inexpedient, there being then no longer any hope of saving structure. When matter has formed, and is plainly discernible, seeking the surface, an early opening is advisable—here as elsewhere ; an opening must form sooner or later, and an early evacuation may not only give relief, but may also

limit disorganization. Then we may hope only for a minor result of treatment—anchylosis ; or for a gradual cessation of morbid action, leaving the joint crank, weak, yet movable, and a limb impaired both in its symmetry and in its function. To conduce towards such ends, we mainly trust to general treatment ; keeping the parts steady by means of splints.

Now there can be no harm in undoing flexion completely, and keeping the limb straight. Tension of the joint is not likely to occur ; so much disorganization having taken place. And, by maintaining the straight posture—by means of the long wooden splint, if necessary—dislocation is rendered less likely, and the position is made more favourable for usefulness after anchylosis. In open disorganization of the joint, the straight splint may not be tolerated ; then relief is obtained from the gum or leather splints, as formerly noticed, (*Principles*, p. 392.)

When, from synovitis, imperfectly resolved, a stiffness of the hip remains, orthopædic treatment may be applied with advantage ; friction, passive motion, and perhaps subcutaneous section of resisting muscles. But, in the case of anchylosis following structural change in the joint, the result of morbus coxarius, all such attempts will be wisely desisted from ; we ought rather to content ourselves with possession of a partial cure, than incur the risk of return of the disease in an aggravated form

There are cases, however, in which the propriety of resection may be not unreasonably entertained ; when, in an open state of the joint, after spontaneous dislocation, the head of the bone seems to cause much excitement in its new site ; when there is good reason to suppose, that the disease has all along been chiefly limited to the head of the bone, leaving the acetabulum comparatively uninjured ; and when it seems probable, that, after removal of the head of the femur, quiet might be restored to the joint, and a certain degree of useful motion might be regained. Successful cases are already on the records of surgery.

The diagnosis of morbus coxarius from other diseases is important. It is simulated by sciatica, by enlargement of bursæ, by lumbar disease, by rheumatism, by interstitial absorption of the neck of the thigh bone in the aged, and by

wasting of the limb consequent on general irritation in the young. 1. Sciatica is known, by the pain following the course of the sciatic nerves ; the whole thigh is lame ; position of the trochanter, and the length of the limb, are unchanged. 2. Beneath the conjoint tendon of the psoas magnus and iliacus internus muscles, a bursa is interposed, where the tendon plays on the capsule of the hip-joint. And this bursa is liable to chronic enlargement ; causing pain in the hip and knee, flexion of the thigh, disuse and wasting of the member. The enlargement may be felt, and is painful on pressure ; succussion of the joint itself causes no pain ; abduction and rotation of the limb are not attended with inconvenience ; but forcible extension of the thigh, and inversion of the foot, cause pain, by stretching the affected part ; and pain is also felt when the patient himself flexes the thigh, or everts the foot—the tendon then acting directly on the bursal swelling. 3. Disease of the lumbar vertebræ, inducing neuralgic pains in the hip and limb, and impeding progression, is suspected from absence of the positive signs of hip-joint disease, as well as of those of bursal affection ; and its existence may be ascertained, by a careful inquiry into the history of the case, with careful manipulation of the lumbar and sacral regions. 4. Young girls, about the time of puberty, or earlier, are apt to fall into a state of general disorder of system. Among other signs of this, lameness of one limb, perhaps with occasional pain of the knee, may occur ; and, on examination, the limb may be found smaller than its fellow, the muscles soft and flabby, and the hip consequently somewhat flattened. Abduction, rotation, and succussion, however, are all well borne ; and, on the affected limb, the patient may hop round the room, with impunity. It were cruel, as well as futile, to confine that patient to constant recumbency, to leech the hip, or to bring out crops of pustules over it. It is sufficient to enjoin moderate exercise, sea-bathing, friction, and general tonic treatment. 5. The other affections mentioned, as liable to simulate hip-joint disease, are detected by ordinary care in diagnosis ; they require no special remarks.

Resection of the Hip-joint.

Till lately, this operation has not had a place in surgery. And it is still begirt with difficulty and danger. As just stated, in a few cases of advanced morbus coxarius it may be deemed warrantable ; when the head of the femur is dislocated, and is causing continuance or aggravation of excitement ; when the joint is open ; and when there is reason to believe that the acetabulum is comparatively free from disease. Also, in gun-shot wounds, and other similar injuries, involving the head or neck of the femur only, removal of these parts is infinitely preferable to amputation of the whole limb ; and may be had recourse to unhesitatingly, with a good prospect of success. No decided rules can be laid down to guide the manipulations. The form and extent of the wound will depend, very much, on the nature of the openings which already exist.

In the case of an anchylosed hip, the neck of the bone may be divided ; with the view of forming a false articulation at the sawn part, and so restoring motion. (*Principles*, p. 414.) Success has already attended the experiment ; its reputation for safety and expediency, however, is as yet by no means determined.

Affections of the Knee and Ham.

Affections of the knee are not so peculiar as to require separate consideration. This joint, it will be remembered, is especially subject to synovitis, chronic and acute ; to disease of the bone, and of the cartilages ; and to the formation of loose bodies within the synovial cavity. It is not suitable for the operation of Resection.

Housemaid's Knee—that is, enlargement of the bursa over the patella—is extremely common in housemaids, shop-keepers, and others who habitually exert much pressure on this part. The affection is usually chronic ; sometimes, however, the case is acute, and apt then to be associated with erysipelas. The ordinary treatment is required. (*Principles*, p. 420.)

Abscess of the Ham is by no means unfrequent ; and may

be connected with exfoliation from the posterior part of the femur. When the portion of dead bone is large, considerable difficulty may be experienced in effecting its removal ; and free incision may be necessary. In such circumstances, caution is obviously required, lest injury be done to the artery, vein, or nerve.

Tumours may form in the ham. As already stated, it is perhaps the most frequent site of external aneurism. Ganglionic and bursal enlargements form ; producing more or less inconvenience. Erectile, fatty, encysted, and fibrous tumours are also met with. The ordinary treatment is required. Removal should be early, before deep and inconvenient attachments have been formed.

CHAPTER XL.

INJURIES OF THE LOWER EXTREMITIES.

FRACTURES.

Fractures of the Pelvis.

THE bones of the pelvis give way, only under a great and crushing force ; a heavy weight, for example, passing over, or falling on the part. There is but little displacement ; muscles not tending thereto. The great risk is from injury done to the important parts within. The bladder may be torn, or it may be punctured by a spiculum, as formerly noticed ; bowel may be ruptured ; great extravasation of blood may occur. From such læsion of structure, immediate danger to life results. A risk, somewhat more remote, follows mere bruise of the interior ; inflammatory action being lighted up within, and advancing both rapidly and untowardly. Or, instead of union, abscess may form at the site of fracture. In treatment, little is to be done in the way of replacement ; the chief care must be directed towards avoidance of motion, and the averting of inordinate action. The application of a broad,

firm bandage, suffices for the former indication ; the latter is fulfilled in the ordinary way.

1. A waggon wheel, rolling over the pelvis, may detach *the Crest of the Ilium* from the body of the bone. The upper fragment is displaced inwards ; and replacement may be effected by the fingers, ere swelling has occurred. 2. From a heavy and high fall, fracture of the *Sacrum* may result. The fracture is usually longitudinal ; and there is no displacement. 3. A kick may cause fracture of the *Coccyx* ; and there may be considerable displacement inwards. By the finger in the rectum, accurate readjustment may be effected ; and it is very obvious that, in the after treatment, both purgation and constipation are to be avoided. 4. The *Os Pubis* may give way in its horizontal body, or in its descending ramus. This fracture is especially hazardous, from the risk which displacement of the sharp fragments, inwards, entails upon the bladder. The necessary treatment was formerly considered, (p. 495.) 5. The ascending ramus of the *Ischium* is as frequently broken as any other part of the pelvis. Crepitus is readily felt by the finger in the rectum or vagina ; and, by the same means, readjustment of the fractured portions is to be effected. 6. The *Acetabulum* may be split ; and injury of the neck of the femur may be simulated. There is no shortening of the limb ; and crepitus is felt by the finger in the rectum or vagina—when the pelvis is moved, not during mere rotation of the thigh.

Fractures of the Femur.

I. *Fracture of the Neck, within the Capsule.*—This accident is almost peculiar to advanced years ; and occurs more frequently in women than in men. The external dense portion of the bone is atrophied, a mere thin shell enclosing the cancellous texture ; the neck becomes rectangular, instead of being oblique, in relation to the shaft of the bone ; and there is, besides, the brittleness of the osseous texture peculiar to old age. The accident may be the result of direct violence, as by falls on the hip ; more frequently it is the result of indirect violence, as by a slip or stumble, of compara-

tively trivial amount. The upper fragment remains in situ; the lower fragment is drawn upwards by the muscles of the hip, and rests above and on the brim of the acetabulum—further elevation being resisted by the capsular ligament. Such displacement may not occur immediately, however; not until spastic action of the muscles takes place—it may be, some hours after the receipt of injury. By muscular action, also, the lower fragment is everted; the muscles inserted into the trochanteric fossa, inter-trochanteric line, and trochanter minor, especially conducing to this change. On examination—best conducted with the patient laid straight on his back—the following signs of the injury are observable. There is shortening of the limb, from half an inch to two inches; but perhaps not immediate, as just explained. The toes are everted, and the eversion can be undone by the surgeon, though not without the infliction of much pain. Like the shortening, the eversion may at first be but slight. In some few cases, inversion is found; but that position is accidental; resulting from the nature and direction of the inflicting force, and from absence of the muscular action which ordinarily determines the displacement, and which might have undone the position in which force had first placed the limb. The trochanter is higher and flatter, than its fellow. Voluntary motion and power are greatly abridged; forced motion is preternaturally extensive. On rotation of the limb, the hand or ear, placed over the trochanter or on the groin, is aware of a distinct crepitus; but only when extension has previously been made, so as to bring the fragments into apposition. By gentle extension, the shortening may be undone, and the two heels may be brought together; but, on ceasing to extend, muscular action soon restores the shortening as before. On rotating both thighs, the trochanters will be found “moving in the arcs of different circles; that on the injured side rolling on its own axis, while the healthy trochanter describes an arch of which the neck forms the radius.” There is no great amount of swelling; as can readily be understood, when the nature of the injured parts is considered.

Union of this fracture is quite possible, but yet improbable. The following are the more important obstacles to such

an occurrence. 1. There is an obvious difficulty in maintaining accurate apposition ; restraining splints cannot be applied to the part itself, and it is difficult to maintain an uniform ascendancy over the retracting muscles. If the periosteal investment remain partially entire, however, there may be little displacement, and proportionally slight shortening ; and, in such a case, a better issue may be looked for. 2. There must be a want of provisional callus ; there being no structure from which it may be produced, and in which it may be formed and sustained ; the synovial capsule is obviously barren in this respect. The fractured ends may be said to be steeped in an increased secretion of synovia. 3. Also the definitive callus, which, if uninterrupted, might alone achieve consolidation—as happens in other fractures, when from any cause the provisional formation has been aborted—is ever liable to accident, by even slight movement of the parts. 4. The upper fragment, or head of the bone, nourished only through the round ligament, must be of weak power, and ill able to execute the exalted nutritive action necessary for reparation. 5. The age of the patient, and the atrophied condition of the bone itself, are obviously unfavourable to reunion.

With such adverse complications, it is no wonder that examples of union in this fracture are most rare. And yet circumstances may occur, in which that result may be attempted and expected, with every reasonable prospect of success. When, for example, the patient is comparatively young ; when the shortening is slight, indicating but partial division of the periosteal investment ; when the patient joins heartily with the surgeon in the use of means calculated to maintain apposition, and to prevent all movement of the fragments ; and when neither become weary of the prolonged period of vigilance required—for, be it remembered, provisional callus is wanting, and the definitive must do all, (*Principles*, p. 678.) The ordinary result is the formation of a false joint ; the parts becoming accommodated to each other by absorption, connected by new fibrous texture, and further restrained by a thickened state of the capsular ligament ; the limb remaining deformed, and comparatively powerless, yet permitting of tolerable comfort and usefulness, with the aid

of a stick or crutch. In the extremely old, fatal sinking is very probable; under the shock of the injury, and the irritation of pain and confinement.

In the last named class of patients, the use of means for effecting retention of the fragments is not expedient. Success cannot result; the annoyance will but aggravate the general disorder; and, not improbably, sloughs will form at the points where the splint exerts its pressure. It is sufficient to arrange the limb comfortably on pillows; and by very gentle swathing or deligation, to restrain motion. In the more hopeful cases, the long splint is to be applied as in treatment of the following injury.

II. *Fracture external to the Capsule, and above the Trochanter.*—This is usually an *impacted* fracture; the upper fragment being driven into the cancellated texture between the trochanters, and firmly wedged there. In such circumstances, there is but little displacement; crepitus, even, may be obscure; and power of the limb, both as to motion and the sustaining of weight, may be wonderfully preserved—continuity in the bone having been restored by the impaction, immediately after it had been dissolved by the fracture. Not unfrequently, however, impaction is not so complete as this; and sometimes it does not occur at all. This form of fracture usually results from direct and severe violence, as by falls or heavy blows on the hip. It differs from the preceding; in the mode of occurrence, as just stated; in its liability to occur at any age; in a greater amount of swelling and pain following—the fleshy textures being more or less extensively implicated; in a greater amount of constitutional sympathy being manifested—the injury being altogether more severe; in there being a less amount of shortening and eversion, with a greater amount of power and motion; and in crepitus being very palpable, when full extension, and consequent disentanglement, have been effected—but obscure, or altogether wanting, until then. When impaction has not occurred, the slightest motion causes a very distinct crepitus; there being comparatively little retraction of the lower fragment. The degree of shortening varies, from half-an-inch to three-quarters of an inch.

A more important difference exists, in this fracture being

capable of satisfactory union. The best mode of treatment is by application of the straight, light, wooden splint. It should extend from a little below the axilla, to a little beyond the ankle, when the patient is straight and recumbent; and, having been well padded, more especially at the points where pressure is likely to be greatest—at the trochanter, external condyle, and malleolus—it is made one with the limb, as it were, either by bandaging, or by the swathing of a broad linen sheet. Then a soft shawl, or other suitable band, is passed beneath the perineum, on the affected side; and has both its ends tied on the upper end of the splint—there being two holes placed there for this purpose. A broad bandage or belt is also applied firmly round the pelvis, so as to bind the splint more securely on the limb, and keep the broken surfaces in apposition. By tightening the perineal band, from time to time, the splint is forced downwards; the splint, having been made of a piece with the limb, brings the latter with it; and thus such extension is made, as is likely to prevent retraction by the muscles, and to maintain the limb of its proper length. Indeed, in practice, it is well to have the extension such as to make a seeming elongation on the affected side. On resumption of the erect posture, and use of the limb, such lengthening soon disappears.

Cases of complete impaction would require little or no treatment, were we content with a permanently shortened limb. But, in order to obtain a perfect cure, it is evident that the impaction must be undone by extension, and the normal length of the limb thus restored.

III. *Fracture through the Trochanters.*—This is also the result of direct and severe violence. There is usually much displacement; and, in consequence, crepitus may at first be obscure. On extension and rotation, the hand, placed over the trochanter, ascertains that the upper fragment is fixed, while the lower moves with the thigh. Treatment is by the long splint.

IV. *Fracture of the Trochanter Major.*—This process may be broken off from the shaft of the bone. It is displaced upwards, by the action of the lesser glutei muscles; and a hiatus can be felt between the two portions. The signs of solution of continuity in the shaft are absent. Accurate ap-

proximation and retention are effected with difficulty ; and, in consequence, union is generally by ligament. Splints are unnecessary ; it is sufficient to maintain recumbency, in such a posture as is likely to conduce to relaxation of the displacing muscles.

V. *Fracture below the Trochanter Minor.*—The indications of this accident are sufficiently plain. The end of the upper fragment is tilted much forwards, by the action of the psoas and iliacus muscles ; while, by the muscles of the thigh, the lower fragment is drawn upwards, and usually inwards—the action of the adductors preponderating. The consequent deformity and shortening are great. Extension and rotation cause distinct crepitus ; and the preternatural mobility of the part, and the loss of continuity in the shaft, are very apparent. Adjustment having been made, by extension and coaptation, the limb may be secured to the long straight splint ; and sometimes it is expedient, in addition, to place pasteboard splints directly on the fractured part—one on the inside extending from near the perineum, one on the outside extending from the trochanter major, and both reaching to the knee. They are secured by bandaging, before the long splint is applied. But, in some cases, the double-inclined plane is preferable—MacIntyre's splint, simplified and improved by Liston ; the spontaneous rising of the upper fragment being thus humoured, while the lower part of the limb is brought up to it. The trunk should also be somewhat elevated ; to relax the muscles of the minor trochanter. In children, it is well to varnish the bandaging ; and so to prevent the necessity for frequent renewal of dressings, on the score of cleanliness. It has lately been proposed to place the patient recumbent ; to support the limbs by means of a frame-work and sling, in the same relative position as if seated on a chair ; and to maintain permanent extension of the broken thigh, by means of a weight attached to the foot ; the rising end of the upper fragment being thus accommodated.*

VI. *Fracture above the Condyles.*—The lower fragment is usually displaced backwards, by the action of the popliteus

* *British and Foreign Review*, No. 32, p. 509.

and gastrocnemius. The upper fragment, pushed forwards, may penetrate muscles and skin, and so render the case compound. The signs of the injury are obvious and plain. Treatment is by the double-inclined plane, with the knee considerably bent.

VII. *Diastasis*, or separation of the shaft of the bone from its epiphysis, may take place in the adolescent ; simply, by direct violence ; or with more or less rotation of the detached part, the limb having been twisted by a wheel, or in machinery. Retention is best effected in the straight position ; with the use of common splints, of wood or pasteboard ; or laying the limb in MacIntyre's splint, fully extended.

VIII. *Fracture of the Condyles* may take place, extending into the knee-joint. There is much swelling of the joint, and crepitus is felt on the slightest motion. This is also best treated in the straight position. But watchfulness and activity are especially requisite, to avert inflammatory action, which is apt to seize upon the synovial capsule, and to prove severe. After the first fortnight, to prevent stiffness, gentle passive motion of the joint is expedient ; provided the parts are quiet enough to admit of this.

In all fractures of the thigh, the limb's use must be resumed very gradually, crutches being used to bear weight at first, lest bending and shortening occur after apparent consolidation. And this precaution, indeed, is necessary in all fractures of the lower extremity.

Compound Fractures of the thigh, especially at the upper part, are prone to an unfavourable issue ; by suppuration and constitutional disturbance. No peculiarities of treatment need be specified ; further than that the patient's fate usually hinges, on the prophylactic and antiphlogistic constitutional treatment of the first ten days.

Fracture of the Patella.

Longitudinal fracture of this bone is the result of direct violence, and may be attended with comminution. Inflammatory action is liable to occur, implicating the joint ; and active prophylaxis, in this respect, is in consequence essential. Bony union readily takes place, unless action prove ex-

cessive. No complicated apparatus is necessary ; it is sufficient to prevent motion, by a short splint under the ham, lightly retained by bandaging.

Transverse fracture is more common ; the result more frequently of muscular action than of direct injury—as when a person, in full exercise, endeavours suddenly to save himself from falling. In short, when the knee is bent, and the extensor mass of muscles acts violently, the patella is apt to be broken across, over the condyloid aspect of the femur. The lower fragment remains in situ. The upper portion is retracted upwards on the thigh, by the extensor muscles ; and a wide hiatus is left between, in which the condyloid surface of the femur may be plainly felt. The limb is powerless, more especially when descent in progression is attempted ; the extensor muscles proving impotent.

Treatment is usually simple ; position often being alone sufficient, to effect reduction and retention. The limb is straightened and elevated, so as to relax the extensors on the thigh ; a bandage is applied, from the toes upwards, to prevent engorgement of the limb ; and, if coaptation be not quite complete, the bandaging may be arranged in the form of the figure 8, at the knee, so as to force the fragments gently into apposition. The trunk is also elevated, in a half-sitting posture. Accurate apposition and osseous reunion may be obtained ; but this result is not desirable ; the knee being apt to prove crank and limited in its movements, and recurrence of the fracture being by no means improbable. Short ligamentous union is preferable ; affording sufficient firmness and resistance for action of the muscles, leaving the play of the joint unfettered, and proving less liable to recurrence of a solution of continuity. As the consolidation advances, passive motion is gently begun ; otherwise, the muscles may prove slow in recovering their function.

Should peculiarities of the case render such simple treatment insufficient, and a ligamentous union of redundant length be threatened, more coercive measures are necessary. A broad leather belt is passed round the limb above the patella, another below it ; by cross belts, tightened as circumstances require, the circular girths are brought together ; and their approximation includes that of the fragments of the pa-

tella. Or, Lonsdale's apparatus may be worn; which has the advantage of avoiding constriction of the limb. In cases of non-union, the constant wearing of such an apparatus restores the limb to a great degree of usefulness. Lately a case occurred to me, in which it was found quite impossible to maintain satisfactory apposition of the fragments, on account of a large bulging in the thigh, caused by exuberant callus—the result of previous fracture.

Compound Fractures of the patella have generally an unfortunate issue; the joint inflaming acutely, and becoming disorganized. Not unfrequently, amputation is required, to save life.

Fractures of the Leg.

Fracture of the Head of the Tibia is the result of great and direct violence; the fracture extending into the knee-joint. Treatment is as for the analogous fracture of the femur, at its condyles. The limb is placed straight, so that the condyles may act as retaining splints on the fragments; and the limb is also elevated, so as to relax the extensor muscles, which, through the ligament of the patella, act on the lower fragment. Passive motion is necessary, so soon as consolidation has advanced so far as to admit of it.

Fracture of the Tibia immediately below its Tubercle.—The peculiarity of this form of injury is, the tendency to rising in the upper fragment, through agency of the muscles acting by the ligamentum patellæ. The rising is aggravated by flexion of the knee. The limb is therefore placed and retained in the straight posture, and elevated.

Fracture of the Tibia, at any lower point, is best treated on the double-inclined plane. When this bone suffers alone, there is but little displacement; the fibula acting as a restraining splint.

Fracture of the Fibula.—This bone most frequently gives way near its lower extremity, at a short distance above the external malleolus. When force is suddenly applied, so as to cause eversion of the foot—as in twisting the foot, on the side of a stone, or in a gutter—this eversion is resisted by the external malleolus; but if the force be sufficient to

overcome the resistance, the bone snaps at its weakest point—from two to three inches above the ankle-joint—and eversion of the foot is effected. There is immediate lameness, and the patient may be sensible of something having snapped in the leg; the foot is found turned out; and, if progression is attempted, the patient leans on the inside of the foot, so as to support himself on the tibia. A marked depression is observed on the outside of the limb, at the site of fracture; and, on replacing the foot, and making rotatory movement of it, crepitus may be distinctly perceived. The deltoid ligament is ruptured; and the end of the tibia is necessarily displaced, more or less, from the corresponding surface of the astragalus; sometimes it is also moved slightly forwards. Treatment is by Dupuytren's splint; a light piece of wood, in breadth proportioned to the limb, and of length sufficient to extend from the knee to a few inches beyond the ankle. It is applied on the inside of the limb; provided with a pad—considerably thicker at the ankle, than at the upper part. To a hole at the upper part of the splint, a linen roller is attached; and application of this is begun at the ankle—the bandage being occasionally turned over notches made for this purpose in the distal extremity of the splint, so as to maintain complete inversion of the foot, and consequent apposition of the fragments.

Fracture of both Bones of the Leg may be the result either of direct or of indirect violence; a heavy weight falling on, or passing over the part; or the patient falling, and alighting on his foot. In the former case, the fracture is usually transverse, and the bones give way at corresponding points. In the latter case, the fracture is usually oblique, and the bones give way each at its weakest point; the tibia a little above the ankle, the fibula about two or three inches below its head. This latter form of injury is especially apt to occur, in falls or leaps from a vehicle in motion; and one or other of the sharp fragments is apt to protrude through the integument, rendering the case compound. Treatment is best effected by the double inclined plane.

Should pressure on the heel be much complained of, the limb may be laid on its outer side, incased in two pasteboard splints, extending from the knee to beyond the ankle. To

prevent such undue pressure—during the use of the double inclined plane—it is well always, when practicable, to suspend the heel and foot, by means of a sock—the end of which is hung, by a piece of tape, on a knob placed for this purpose on the upper and outer part of the footboard. It is also well, in all cases, to have the limb, in its splint or splints, considerably elevated; either by slinging, or by the placing of blocks beneath.

Compound Fractures of the leg require no special notice. They are, in general, best treated on the double inclined plane; for the wound, being usually either in front, or on a lateral aspect, may be completely exposed, and frequently inspected and dressed, without the limb being at all disturbed, or the retaining apparatus undone.

Fractures at the Ankle.

The Internal Malleolus may be broken off, by twisting of the foot inwards. The fracture is oblique; the displacement is marked, and considerable. The foot is dislocated inwards; presenting its outer edge to the ground. Sometimes, instead of only the malleolus being separated, the fracture includes the whole thickness of the lower end of the tibia; passing obliquely upwards. Replacement having been effected, by manipulation, Dupuytren's splint is applied on the fibular aspect of the limb.

The External Malleolus may be detached in a similar manner, by forcible eversion of the foot; but, as already stated, the fibula is more likely to give way at a point somewhat higher—its weakest part. The same splint is employed, as in the more ordinary fracture.

The Tarsal Bones are occasionally fractured; usually by intense and direct violence. In general, disorganization is such as to leave no hope of recovery; and primary amputation, consequently, is often required. The *Astragalus*, however, may be split and fissured, by a heavy fall received on the calcaneum; there may be little or no displacement; and a satisfactory issue may ensue. The part is kept steady by lateral splints, or by means of the double-inclined plane. Sometimes the tuberosity of the *Calcaneum* is snapped, by

the action of the sural muscles. The symptoms and treatment are the same, as in the case of ruptured tendo Achillis.

Fractures of the Foot.

Fractures of the metatarsal bones, and phalanges, are seldom effected but by a crushing force. Their issue is seldom prosperous, especially when compound. The metatarsal bones, after readjustment, require no splints. It is sufficient to keep the foot at rest and elevated. The phalanges, if not demanding immediate amputation, are arranged and retained by small splints, as in the case of the analogous injuries of the superior extremity.

DISLOCATIONS.

Dislocation of the Pelvis.

FROM heavy and high falls, it has occasionally happened that the *Os Innominatum* has been displaced upwards ; separated from the sacrum, at the sacro-iliac junction, and from its fellow at the symphysis pubis. The following are the diagnostic marks of the injury. The limb of the affected side is shortened and powerless ; yet the signs both of dislocation and of fracture of the thigh-bone are absent ; and the limbs, when each is measured from the anterior superior spinous process of the ilium, will be found quite of the same length. The spine and horizontal ramus of the os pubis will be found unusually elevated ; forming a hard ridge in the ordinary site of the iliac fossa. The anterior superior spinous process, and the crest of the ilium, will be found on a higher level than those of the opposite side. By examination from the rectum, the tuberosity of the ischium will be found raised, and nearer the mesial line ; and the descending ramus of the os pubis will probably be found to be on a plane considerably posterior to that of the sound side. The fold of the nates will be found higher than on the other side ; and, on the injured side of the sacrum, a depression will be felt, at the junction of

that bone with the ilium. More or less difficulty may be experienced, in evacuating the bladder.

Should the nature of the case be distinguished in time, moderate efforts may be made for re-adjustment ; by extension of the limb, and forcing the ilium downwards with the hand. The bladder is relieved by the catheter, as often as circumstances may require ; and the flexible catheter is likely to pass more readily than the metallic instrument. The same attention to the state of the internal organs is required, as in the case of fracture of the pelvis. Indeed, fracture of the os pubis is not unlikely to be associated with such an accident. Prognosis is unfavourable.

Separation of the *Symphysis Pubis* is said occasionally to occur, in difficult labour. It may also result from direct injury. Displacement is not great. By a broad belt the parts are kept unmoved, as well as in apposition.

Dislocations of the Hip.

The head of the femur may be displaced, in various directions. The displacing force is usually indirect ; but the accident occasionally results also from direct blows or falls upon the hip. It may take place at any time of life ; but most frequently affects the young or middle-aged adult. In youth it is rare ; in old age, fracture of the neck of the femur is much more liable to occur.

I. *Dislocation upwards, on the Dorsum of the Ilium.*—This is by far the most frequent form of the injury ; usually resulting from a fall under a heavy weight. Examination is best made in the erect posture. The limb is shortened, from one inch and a half to two inches ; and is turned inwards, the toes resting on the opposite instep, with the knee advanced somewhat in front of its fellow. Motion is much abridged, especially in an outward direction. The trochanter is less prominent than it should be, and is also preternaturally near to the anterior superior spinous process of the ilium. If there be not much swelling, the head of the bone may be felt rolling in its new site, during rotation of the knee inwards. There is also diminution of roundness in the injured hip.

Fracture of the neck of the femur is the injury most likely

to be mistaken for this dislocation. Diagnosis rests on the following points. In dislocation, the motions of the limb, both voluntary and forced, are abridged ; there is invariably inversion of the foot, and this inversion cannot be undone, until reduction has been effected ; the toes may be moved round forcibly, but the whole body turns with them ; on extension being made, the normal length of the limb cannot be restored, until reduction has occurred ; and then there will be no recurrence of the shortening, unless fracture of the brim of the acetabulum exist. True crepitus is felt, only in the case of fracture. The occurrence of dislocation is much more rare than that of fracture ; and, while dislocation may occur at any age, fracture within the capsule seldom if ever is found to take place under the age of fifty. Fracture external to the capsule is at once known, by the distinctness of the crepitus—when extension and rotation are made, and when the trochanter is pressed inwards.

Reduction is effected, with or without the aid of pulleys, and their auxiliaries ; according to the date of the injury, the robustness of the patient, and the other circumstances of the case, (*Principles*, p. 699.) The patient is placed recumbent on his back ; and extension is made obliquely across the opposite limb ; the thigh crossing its fellow a little above the knee. The laque, to which the pulleys are attached, is applied either above the knee, or at the ankle, as the surgeon may prefer, (*Principles*, p. 700.) Counter-extension is made, by means of a strong belt—well padded—passed beneath the perineum, and secured to a fixed point behind the patient. When extension has been made for some time, the limb is rotated outwards.

Or, the patient being placed erect—resting his weight on the sound limb, stooping over a firm table, and having his pelvis fixed securely thereon—the surgeon takes hold of the foot of the affected limb with one hand, and, flexing the leg on the thigh, presses steadily with the other hand on the popliteal space, downwards. After extension has thus been made for some time, sudden rotation is made on the hip ; and the bone may, thus simply, move at once into the acetabulum.

After reduction, the patient is placed gently in bed ; and no retentive means are necessary—unless the patient be care-

less or violent, by delirium or otherwise. Then it is well to secure the two limbs together, by bandaging, at the knees and ankles: pads being interposed at these points. If, as rarely happens, the upper edge of the acetabulum have been broken, retention is effected with difficulty; and it is necessary to maintain permanent extension of the limb, by means of a long splint with perineal band, as used in the case of fracture.

II. *Dislocation backwards, into the Ischiatic Notch.*—In point of frequency, this form may be placed next in order. “The head of the thigh-bone is placed on the pyriformis muscle; between the edge of the bone which forms the upper part of the ischiatic notch, and the sacro-sciatic ligaments; behind the acetabulum, and a little above the level of the middle of that cavity.”* The accident results from the application of force, while the body is bent forward on the thigh, and the knee is pressed inwards. The signs bear a general resemblance to those of the preceding injury; but occur in a minor degree. The shortening is from half an inch to an inch. The foot is inverted, and the great toe rests on the ball of the great toe of the opposite foot. The trochanter is behind its usual place, and is slightly inclined towards the acetabulum. The head of the bone can seldom be felt distinctly. The joint is preternaturally fixed; flexion and rotation, in any considerable degree, being quite impracticable. The whole body cannot be straightened in the recumbent posture; if the trunk be smoothed down, the thigh rises up; and if the limb be forcibly and painfully straightened, the loins are found immediately and insuperably arched—and this characteristic will not cease, until reduction have been effected.

Reduction is made with the patient recumbent, on his sound side; and the limb is extended obliquely, so as to bring it across the middle of the sound thigh. After extension has been maintained for some time, the head of the bone is lifted over the margin of the acetabulum, by means of a towel placed under the upper part of the thigh; extension in that direction being made, by passing the loop of the towel over an assistant's neck, while counter-extension is made by his hands

* SIR ASTLEY COOPER.

resting firmly on the patient's pelvis. But it is not to be supposed that such movements are to interfere with the main extending force ; the two are carried on consentaneously.

III. *Dislocation downwards, into the Foramen Ovale.*—This—as well as the following variety—is comparatively rare. It is usually caused by a heavy weight falling on the pelvis, while the trunk is bent forwards, and the thighs are separated from each other. The limb is elongated, to the extent of nearly two inches ; and is advanced in front of its fellow, the toes usually showing neither inversion nor eversion. The thigh is much abducted, and cannot be brought near its fellow. The trunk is bent forwards, during maintenance of the erect posture ; and the tense ridge, formed on the inside of the thigh by the stretched psoas and iliacus muscles, can generally be both seen and felt. The trochanter is flattened and depressed. The head of the bone can be felt—only in thin patients, and in the absence of swelling—by pressure on the inner and upper part of the thigh towards the perineum. The position of the limb somewhat resembles that which attends on the first stage of morbus coxarius ; and a mistake in diagnosis would be fraught with the most direful consequences ; but, with ordinary care, such a misfortune is not likely to occur. Elongation of the space between the anterior superior spinous process of the ilium and the trochanter major, is of itself a sufficient test of the dislocation.

The patient is placed flatly recumbent ; and counter-extension is made across the pelvis, by means of a strong belt passed round it. Extension is made in the opposite direction, at right angles to the pelvis ; the pulleys being attached by means of a loop passed under the upper part of the thigh, and with one portion of the loop passed over the belt whereby counter-extension is made. Extension is applied gradually, until the head of the bone is felt moving from its anormal site. The surgeon then, passing his hand behind the ankle of the sound limb, grasps the ankle of the dislocated member, and draws it inwards, towards the mesial line of the body. The foot should not be raised, lest the head of the bone slip into the ischiatic notch—a casualty, however, which is far from being irreparable.

Or, the patient having been placed recumbent, on the

sound side, and the apparatus arranged as before, extension is made directly upwards, while the knee and foot are pressed down.

IV. *Dislocation forwards on the Pubes.*—This accident happens, when a person, while walking, puts his foot into some unexpected hollow ; his body being at the moment bent backwards. The head of the bone is then forced upwards and forwards, on the horizontal ramus of the os pubis. The limb is shortened to the extent of an inch. The knee and foot are turned outwards, and cannot be rotated inwards. The head of the bone may be distinctly felt and seen, forming a globular tumour ; resting above the level of Poupart's ligament, on the outside of the femoral vessels ; and obedient to the motions of the thigh.

The patient is placed flatly recumbent on a table, with the affected limb projecting over the edge. Counter-extension is made in the ordinary way, by the perineal band—secured behind, and a little above the level of the patient. Extension is made in a line behind the axis of the body, carrying the thigh downwards and backwards. After some time, the head of the bone is lifted over the margin of the acetabulum, by means of a towel placed under the upper part of the thigh. And rotation inwards is also likely to be of service.

Anomalous dislocations of the Hip.—Besides the ordinary varieties of dislocation, the following have been observed. 1. The head of the femur has been displaced, so as to rest on the anterior superior spinous process of the ilium—or rather on the space between the two spinous processes of that bone, the trochanter major lying on the dorsum ; such displacement having been determined by the direct effect of the force, and muscular action having, from some cause, failed to modify displacement in the usual way. 2. Or, in like manner, the head of the bone may rest on the anterior inferior spinous process of the ilium, the trochanter major lodging in the acetabulum. 3. The head of the bone has been found resting on the tuberosity of the ischium, and also upon the spinous process of that bone.

Dislocations of the Knee.

Dislocations of the knee joint are caused only by great violence, and are of rare occurrence. The displacement cannot occur, without much disruption of the retaining parts ; and, in consequence, replacement is generally effected without difficulty.

The *Tibia* may be luxated from the femur, in four different directions. 1. *Backwards*, behind the condyles of the femur ; causing shortening of the limb, prominence of the condyles in front, depression of the ligament of the patella, and bending of the leg forwards. 2. *Forwards*.—The condyles are thrown back, and compress the popliteal vessels ; the tibia and patella are elevated in front ; the limb is shortened and slightly flexed. These dislocations are complete ; the other two are only partial. 3. *Inwards*.—The internal condyle of the femur rests upon the external semilunar cartilage ; and the tibia projects plainly on the inner side of the joint. 4. *Outwards*.—The external condyle rests on the inner semilunar cartilage ; and the projection is on the outside of the joint.

Reduction is, in general, readily effected, by extension and coaptation. Antiphlogistics are required subsequently, to ward off or modify the intense inflammatory action, which is apt otherwise to ensue after so serious an injury. The compound luxations usually require immediate amputation.

Gradual displacement of the knee, by muscular action, in the case of advanced structural change, has been already considered, (*Principles*, p. 388.)

The Semilunar Cartilages are sometimes displaced, by twisting the joint ; as when a person in walking, with the foot everted, strikes the toes against an obstacle ; or when the foot, in walking, becomes suddenly caught in a crevice or hole. Perhaps there is a predisposing cause in operation ; namely, unusual relaxation of the retaining ligaments of these cartilages. The cartilages are pushed from their normal site, by the condyles of the femur, which then come in direct contact with the head of the tibia. The limb is immediately rendered stiff, and incapable of bearing weight ; and a sickening pain is felt. Extreme flexion of the joint, by disengaging the parts, usually suffices for restoration of the normal

state ; the cartilages, by their elasticity, seeking their own place, when free. The knee remains weak and swollen for some considerable time—perhaps the seat of rheumatic pains ; and the use of a knee-cap is expedient. If chronic structural change threaten to ensue, that must be opposed by the ordinary means.

Dislocation of the head of the Fibula is a rare accident. It may take place, by violence, either backwards or forwards. Reduction is effected by direct coaptation ; and bandaging sufficiently effects retention. Should displacement depend on relaxation of the retaining ligament, the pressure of a knee-cap or bandage is necessary ; with stimulation of the part, to restore the normal state if possible.

Dislocations of the Patella.

The Patella is liable to be displaced, in various directions ; by external violence, applied directly or indirectly. But such accidents are rare. 1. *Outwards*. This is the most common ; and is most apt to occur, in persons who are knock-kneed. The bone is thrown outwards on the external condyle, and forms a manifest projection there ; the knee is incapable of flexion. 2. *Inwards*. This is the result of direct injury ; the bone being struck on its outer side, while the foot is turned inwards. The mal-position is the reverse of the preceding. Reduction in either case is effected, by raising the leg—so as to relax the extensor muscles on the thigh, fully ; at the same time, with the hand, forcing the bone back to its place.

3. The patella may be displaced, by *Semirotation* ; one edge resting on the middle of the articular surface between the condyles of the femur, while the other projects beneath the tense integument. Reduction in this case is to be effected, by flexing the knee to the utmost ; so as to free the bone, and admit of its being drawn into its normal position by the action of the extensor muscles. Should this means fail, it may be expedient to divide the ligamentum patellæ, by subcutaneous incision.

4. The bone can be displaced *Upwards*, only on division of the ligamentum patellæ, by wound or tear. The treatment is as for transverse fracture of the patella. 5. Slight dis-

placement, *Downwards*, may follow rupture of the tendon of the rectus muscle.

Dislocations of the Ankle.

I. *Dislocation of the Tibia inwards*.—This, as already stated, usually coexists with fracture of the lower end of the fibula. The foot is everted; and the internal malleolus projects greatly. Reduction is effected, by extension of the foot; while the limb is bent at a right angle, so as to relax the gastrocnemii muscles. And this flexed position of the leg, be it remembered, is essential in the treatment of all luxations at the ankle. Replacement having been accomplished, Dupuytren's splint is applied on the inner side of the limb; and should it seem necessary, for complete retention, a minor splint may be placed on the outer side also.

II. *Dislocation of the Tibia forwards*.—This, too, attends on fracture of the fibula. It may also occur independently of fracture; but then the fibula is displaced along with it; and the case is one of luxation of both bones. The tibia rests on the upper surfaces of the navicular and internal cuneiform bones, and on a small part of the anterior surface of the astragalus. The foot is fixed, and appears much shortened; the heel is proportionately elongated; the toes are pointed downwards; there is a marked depression in front of the tendo Achillis; and the end of the tibia is felt to be resting on the middle of the tarsus. The treatment is as in the former case; a splint being applied on each aspect of the limb.

A minor form of the injury may occur; the end of the tibia resting partly on the navicular bone, and partly on the astragalus.

III. *Dislocation of the Tibia outwards*.—In this case, the fibula is associated in the displacement; and both bones form a manifest projection on the outer aspect of the joint. The foot is turned inwards, its outer edge resting on the ground; and the toes are pointed downwards. The internal malleolus is obliquely fractured and detached. The treatment is as in the other cases. But especial watchfulness is necessary, as to the consequences; this form of injury being always the re-

sult of much violence, and untoward action being consequently apt to ensue.

IV. *Dislocation of the Tibia backwards* is extremely rare. The end of the bone rests on the os calcis, in front of the insertion of the tendo Achillis; the heel is shortened, and the foot is proportionately elongated.

The foot has also been found forced upwards between the tibia and fibula; these having separated. But this is merely an aggravation of dislocation of the tibia inwards.

The treatment is still by extension of the foot, during flexion of the leg; and by the application of lateral splints.

V. *Compound Dislocation of the Ankle*.—This is the most common of the compound dislocations of joints; and usually takes place inwards. The patient having fallen with much force, with the foot everted, the end of the tibia is driven through the integuments on the inner aspect of the joint; and protrudes to a greater or less extent. Even in extreme cases, the posterior tibial artery generally escapes untorn. This accident may occur to any one; but is especially frequent in adults of advanced years and intemperate habits; and, in these, but a slight amount of violence would seem to suffice for its infliction. The complication of delirium tremens is not unfrequent.

Reduction is effected as in the simple form; and subsequent treatment is conducted according to the general principles formerly stated, (*Principles*, p. 704.) Should ankylosis occur, motion and usefulness are considerably regained, by compensating increase of movement in the tarsus. According to the high authority of Sir Astley Cooper, immediate amputation will probably be expedient; “when the ends of the tibia and fibula are very much shattered; when, in addition to the compound dislocation of these bones, some of the tarsal bones are displaced and injured; when one or other of the tibial arteries is divided, and cannot be secured without extensive enlargement of the wound, and disturbance of the soft parts; when the common integuments, with the neighbouring tendons and muscles, are considerably torn; when the protruded tibia cannot by any means be reduced; and when the constitution of the patient is enfeebled at the time of the accident, and not likely

to endure pain, discharge, or long confinement." The amputation suitable, is that of the ankle-joint.

Secondary hæmorrhage may ensue from the posterior tibial, in a case otherwise affording a chance of cure. In such circumstances, ligature of the superficial femoral is to be performed, if all the other points of the case are favourable. But, if there be a profusion of unhealthy discharge, a manifest indication of ulceration in the joint, or signs of incipient gangrene in the wound and on the foot—then secondary amputation is to be performed, with as little delay as possible.

Dislocations of the Tarsus.

I. Of the Tarsal range of bones, the *Astragalus* is the most frequently displaced by violence. Its dislocation may be either complete or partial; and it may take place in various directions. 1. *Forwards*. This is by far the most frequent form. When the ankle is fully extended, a large amount of the upper articular surface of the bone is exposed; and if, by a fall, a powerful shock should then be applied to the calcaneum, the astragalus is very apt to be loosened and displaced—forwards and inwards—coming to rest on the navicular bone. Sometimes the displacement is forwards and outwards; the bone resting on the os cuboides. The nature of the accident is at once declared, by the manifest appearance of the astragalus in its anormal site. Reduction is to be attempted by persevering extension of the foot, with the leg flexed; while the bone is pushed backwards to its place. Success may attend on the attempt; but failure is just as likely. In the latter case, it is our duty to maintain great quietude of the parts, and to avert inflammatory action. But, if the luxation have been complete, tension of the integument will be such as to render sloughing inevitable at the tense part; and the case so becomes compound. Then, three modes of procedure are open to the surgeon; to retain the parts as they are, and endeavour to bring them through the risks of open suppuration; to perform amputation at the ankle; or to excise the displaced bone, and hope to save both the limb and the joint. The last is to be preferred. Primary amputation is unnecessarily severe; and the first mode is declared by

experience to be hopeless of a successful issue. When, therefore, the case is from the first compound, when it ultimately becomes so by sloughing or ulceration of the strained and bruised integument, and also when the circumstances are such as to render it plain that sloughing or ulceration must soon occur—the luxated bone is to be removed by incision, the limb is to be carefully adjusted, retention is to be maintained by the adaptation of suitable splints, and the case is then to be treated as a compound dislocation of the ankle joint. In partial displacement, no such severity is ever necessary ; in complete luxation, it may not be required ; but in a luxation which is both compound and complete, and in complete luxation which is certain to become compound, such treatment is certainly preferable to the greater severity of immediate amputation—as well as to the perils of profuse suppuration, constitutional suffering, and the almost certain prospect of secondary amputation, which must follow an attempt to retain the bone.

2. The astragalus may be dislocated *Backwards* ; becoming firmly wedged between the tendo Achillis, and the posterior surface of the tibia. The bone is readily felt in its unnatural site ; it is seen protuberant there ; and the end of the tibia is felt projecting in front. Reduction, for obvious reasons, must be very difficult. In only one case, probably, has the attempt ever proved successful—one which occurred to Mr. Liston.*

3. The astragalus has been displaced *Upwards* ; wedged between the tibia and fibula. But this accident is extremely rare.

4. Dislocation has taken place *Outwards* ; and it has also taken place *Inwards*. But such injuries are usually not only compound, but also complicated with fracture of one or other malleolus. They may be so severe as to demand immediate amputation at the ankle ; or they may admit of replacement of the limb, in the hope of saving it, after the dislocated bone has been removed.

In attempting reduction of simple luxations of the astragalus, the surgeon, when foiled in the use of ordinary

* *Lancet*, July 6, 1839.

means, is surely quite warranted in having recourse to subcutaneous section of the tendo Achillis. The consequent removal of the influence of the gastrocnemii, is likely to assist him greatly in a renewal of the attempt.

II. *The Os Calcis and Astragalus* may be separated from the other bones of the Tarsus; the foot becoming displaced inwards, as in Talipes Varus. Reduction and retention are easy; the former by extension and coaptation; the latter by placing the limb on the double-inclined plane, and securing the foot firmly on the foot-board.

III. *The Cuneiform bones* may sustain displacement. Of these, the internal is most likely to suffer. The bone projects inwards; and is also drawn upwards by the action of the tibialis anticus. Reduction will be difficult—probably impossible. But, after a time, the limb may become little less useful than before.

Dislocations of the Toes.

Luxation of the phalanges of the toes is rare. Reduction is readily effected, by extension and coaptation. Compound luxations require amputation.

SUBLUXATIONS AND SPRAINS OF THE LOWER EXTREMITY.

THE hip is seldom sprained. The knee suffers not unfrequently. The twist is usually such as to strain the inner aspect of the joint; and there the ligamentous apparatus may partially give way. Pain is great and sickening; much swelling ensues, perhaps involving the synovial capsule; and the part is apt to remain weak, and prone to recurrence of the injury. In addition to the ordinary treatment suitable for sprain, (*Principles*, p. 706,) the wearing of a knee-cap is essential for some time, until the part, by consolidation, regain its power of resisting the more ordinary applications of force.

Sprains of the ankle are extremely common; by twisting the foot, by a fall, or by a "false step." The most ordinary

sprain is caused by twisting the foot inwards; and the consequent pain and swelling are on the outside of the foot—often great over the belly of the short extensor of the toes. The treatment is by rest, fomentation, leeching, &c. And an elastic bandage on the ankle is necessary, for some time, after walking has been resumed.

INJURIES OF THE TENDO ACHILLIS, AND GASTROCNEMIUS MUSCLE.

Rupture of the Tendo Achillis.—By sudden and violent exertion of the sural muscles, as in leaping, dancing, or running—more especially if the patient be muscular, and unaccustomed to such exercise—the tendo Achillis is apt to give way, close to, or at, its insertion into the calcaneum. There is immediate lameness; the patient falls, and is quite unable to resume the ordinary erect posture; much pain is complained of in the part; and, on manipulation, a very palpable gap is to be found at the site of injury. Usually there is, at the time of rupture, a sensation of something having given way; sometimes there is an audible snap; not unfrequently the patient complains of having been struck at the injured part, although no blow has been sustained there. The treatment is simple. Position, alone, suffices for replacement. The leg is bent, and the foot is extended, so as to relax the sural muscles completely, and favour approximation. This position is maintained by simple means. A slipper is placed on the foot; to the heel of the slipper a stout cord or tape is attached; and this is fastened to the thigh, by means of a circular belt applied there—or to the loins, in a like manner—as tightly as is necessary for securing the requisite degree of flexion. Bending may be voluntarily increased by the patient; and this does no harm. But extension is absolutely prevented. Reparation is slow; (*Principles*, p. 708,) and the period of confinement requires to be extended, a week or two, beyond that required in the case of fracture. After consolidation, extension is made very gradually, lest the uniting medium be over-extended, and

disruption of it ensue. The patient, when first allowed to move about, with a crutch or stick, is provided with a high-heeled shoe ; and, every day or two, a thin slice is cut from this heel, so as to permit a gradual approach of the sole to a full planting on the ground.

Wound of the Tendon is managed in a similar way. Accidental wounds—as by a scythe, knife, or reaping-hook—are usually compound. And, in them, the cure may be facilitated, by approximating the two portions of tendon by means of suture.

Ununited Tendon.—Cases sometimes present themselves, in which rupture of this tendon has not been repaired. The retracted portion has become rounded off ; the calcaneous portion is similarly changed ; and the space between is occupied by dense deposit, quite inefficient for restoring function to the muscles. The hiatus being considerable—perhaps to the extent of two inches, or more—the limb is quite useless in progression. To remedy this state, an incision may be made, the rounded ends of the tendon may be cut off, and approximation may be effected by suture. But this is severe practice. I have lately applied, quite successfully, the principle of subcutaneous section ; (*Principles*, p. 692,) by a stout needle, making raw the extremities of the tendon, and breaking up the intervening space completely ; so restoring the parts to a resemblance of their condition immediately after the original injury ; applying the same simple, retentive, and approximating apparatus, as after recent rupture ; and, after consolidation, employing the same caution in permitting the resumed use of the limb.

Laceration of the Muscle.—Instead of the tendon giving way, the muscular fibres of the gastrocnemius externus may yield. The laceration seldom implicates more than a few of the fibres ; and the site of injury is usually where the muscular fibre ceases and tendon begins. The causes are the same as those of the former injury ; the symptoms are very similar, and the treatment is quite the same, (*Principles*, p. 707.) Sometimes, it is the plantaris which has yielded ; in either its muscle or tendon.

CHAPTER XLI.

AFFECTIONS OF THE FOOT.

Talipes.

By this term is understood, the deformity of *Clubfoot*; generally congenital; yet, not unfrequently, acquired. The original development of the bones is not faulty; but displacement of these is gradually effected, by a predominance of action in certain muscles; such predominance being dependent, either on spasm of those which so act, or on want of action in those which ought to be their antagonists. There is no actual dislocation of the tarsal bones; there is merely a gradual change in their relative positions. A case is related by Delpech which well illustrates the mode of production. A soldier had "the external popliteal nerve injured by a shot;" the peronei, the tibialis anticus, and the extensor muscles, became paralytic, in consequence; and, from the unopposed action of the opponents of these muscles, club-foot resulted.*

There are varieties of this deformity.

I. *Talipes Equinus*.—The muscles of the calf are contracted; the tendo Achillis is rigid; the patient steps on the toes, without bringing the heel to the ground; the foot is in other respects well-formed; but, the extensor tendons being on the stretch, there is a turning up of the toes, independently of that which is caused by pressure in progression.

II. *Talipes Varus*.—This is the most common variety; consisting of extension, adduction, and rotation of the foot—the rotation being analogous to supination of the hand. The muscles of the calf and the adductors of the foot are contracted; the heel is drawn up; the toes turn inwards; the outer edge of the foot rests on the ground; and, in progression, weight is borne on the outside of the foot and on the outer ankle. The toes are extended, as in the former case.

III. *Talipes Valgus* is the reverse of the preceding. There

* LITTLE. *Introduction*, p. 35.

are abduction, rotation, and partial flexion of the foot ; the rotation being analogous to pronation of the hand. The front of the foot is raised from the ground ; and the patient rests on the inside of the instep, and on the inner ankle. The tendons of the peronei muscles are chiefly to blame.

IV. *Talipes Calcaneus*.—The muscles in front of the leg are contracted ; the foot is extremely flexed ; and, in progression, the heel alone touches the ground.

One foot, or both, may be affected by Talipes. In the former case, the affected limb is found thinner and more flabby than the other ; and, sometimes, by arrest of development, it is shortened as well as weak. The mode of progression is painful and imperfect. And, not unfrequently, contraction takes place at the knee, to a greater or less extent.

Spurious Talipes is said to occur, when displacement of the foot takes place, by muscular change, or integumental contraction, following on burns, extensive suppurations, ulcers, &c.

Treatment of Talipes.

In the minor cases, which occur in children, mechanical means—early employed, skilfully adapted, and duly persevered with—are alone sufficient to effect a normal relation of parts. Many such cases occur ; and it is quite unnecessary to subject the little patients to the pain of tenotomy.

When the deformity obviously depends on a paralytic condition of certain muscles—as is more likely to be the case in the acquired than in the congenital examples—attempts may be made to obviate this condition, by remedies directed both to the system and to the part. Attending to the nervous centres, to the chylopoietic viscera, and to the general functions—we may find the symptoms yield, as in the analogous affection of strabismus. And the local means most likely to be of service are, blistering, the endermoid use of strychnine, galvanism, exercise, friction, and passive motion.

Tenotomy is had recourse to, when structural shortening of muscle, of tendon, or of both, has occurred ; and when the obstacles to replacement cannot otherwise be overcome. A large number of cases are so circumstanced. The

operations, however, are but part of the remedial means ; and will certainly fail, unless the suitable apparatus be afterwards employed, well and sedulously. And it is better not to wait for reunion of the tendons—then extending the new bond of union, painfully and slowly ; but to effect the required change of relative position as soon as possible ; leaving the interspace to be filled up by new matter. In the congenital form, the operation may be had recourse to about the twelfth or fourteenth month, when the patient is just beginning to walk ; the mechanical and general remedial means having been in use previously. Extreme cases in the elderly adult should be regarded as irremediable. Tenotomy will fail to effect a cure ; and will do harm, by, for a time at least, impairing very seriously the acquired usefulness of the limbs.

In Talipes Equinus, division of the tendo Achillis is usually sufficient. In Talipes Varus, division of this tendon may suffice, along with the use of mechanical aid. But, very frequently, it is necessary also to divide the tibialis posticus and flexor longus pollicis. In confirmed cases, the tibialis anticus, and extensor proprius pollicis must be added to the list. In Talipes Valgus, the peronei are divided, along with the tendo Achillis. In Talipes Calcaneus, the tibialis anticus is cut, along with the extensors of the toes.

The tendo Achillis is divided a little above its insertion into the calcaneum. The patient having been placed in a prone position, the limb having been steadied, and the foot having been bent, a tenotomy-knife, or needle, is introduced obliquely ; and, by bringing its edge or point on the rigid tendon, the fibres are cut from without inwards ; an assistant flexing the foot forcibly, so as to assist in the disruption. This having been completed, the instrument is withdrawn, and a compress is applied to the aperture. Or, division may be reversed ; from within outwards ; but there is thus a risk of accidentally wounding the integument. The tibialis posticus may be divided, either above the ankle, or near its insertion in the navicular bone. The tibialis anticus is divided in front of the ankle ; from below outwards, so as to save the joint. The flexor longus pollicis is divided, where felt tense in the sole of the foot. Sometimes it is expedient to divide the plantar fascia also ; from below outwards, to save the im-

portant textures beneath. The peroneus longus and peroneus brevis may be divided above the external malleolus, or near their points of insertion ;—the rest, at such points as circumstances may render apparently the most suitable.

It is not improbable that, occasionally, reunion of the divided tendon does not take place ; but that a new attachment is formed. Obviously, section of tendon should be avoided within thecæ ; as, in such a locality, there is but little capability of the expected plastic exudation.

The mechanical apparatus need not be described. Many varieties are in use ; the simplest usually the best. For the Talipes equinus, and the Talipes varus—the two most common varieties—the indications are simple, and may be simply executed ; flexion of the foot, by acting on the ankle ; and restoration of the normal position of the foot, as regards rotation and abduction, by acting on the foot itself.

Flat-foot.

Young adolescents, of delicate health, and exposed to considerable exertion on the feet, are liable to very serious lameness, by a sinking of the arch of the tarsus ; apparently in consequence of relaxation of the connecting ligaments. The arch of the foot is lost, the tibia projects inwards, the foot turns out, the ankle is apt to swell, and progression is slow, awkward, difficult, and painful. The deformity affects both sexes, and all classes ; excited, in the poor, by overwork ; in the rich, by absurd eversion of the feet, and overtasking of the limbs, in attempts to impart polite accomplishments to these organs. By discontinuance of the exciting causes, by friction, by bandaging and the wearing of a roborant plaster on the part, and by general tonic treatment, relief is obtained. It is well also to have the sole of the shoe, or boot, considerably thicker on the inner than on the outer side. And, if matters do not advance favourably, an apparatus may be worn, which will both support the ankle and invert the foot. Sometimes, the young patient, in the process of further development, recovers both symmetry and usefulness.

In confirmed cases, both deformity and lameness are great. “ The peronei and anterior muscles of the foot obtain a pre-

ponderance, and eversion of the foot becomes ultimately as considerable as in true talipes valgus. The preponderating muscles undergo structural shortening; the outer margin of the foot, and even sometimes the front of the foot generally, is raised from the ground; and locomotion is effected to a considerable extent on the heel. The gastrocnemii then waste, and the gait becomes very unsightly." Such cases are to be treated as examples of Talipes. Tenotomy is required, with the subsequent use of rectifying apparatus. And the tendons which require division are, the tibialis anticus, all the peronei, the extensor proprius pollicis, and the extensor longus digitorum.

Corns and Bunions.

These painful affections are the result of pressure, exerted by ill-constructed shoes and boots. They are more easily prevented than cured. 1. The shoe or boot should be large enough, to contain the foot easily; and an allowance should be made for the occasional swelling to which the part is liable, by exercise, heat, and a dependent position. 2. The sole should be at least as broad as that of the foot. The outline of the foot—represented on a piece of paper, on which the patient leans in the erect posture—should be the measure of the sole of the boot or shoe. 3. The boot or shoe should be square, or, rather, rounded in front; not sharp, with the point nearly in a central position. The point, corresponding to the end of the great toe, should be nearly in a line with the inside of the instep. And abundance of room should be given for each toe to occupy its own place, without any crowding, or overlaying of its fellows.

Corns consist of two parts. A thickening of the cuticle; and a hypertrophied and irritable condition of the corresponding papillæ of the true skin. The inflammatory process may supervene. And then a small abscess may form; very painful, because the matter is confined by the dense cuticle; and very frequently leading to smart erythema or erysipelas of the foot. Corns are also said to be Soft and Hard. The former situate on the outer points; the latter placed between the toes, where there is naturally considerable moisture

Another division of corns is into the Laminated and Fibrous. In the former, the hypertrophied cuticle is arranged in a laminated form ; and there is an uniform enlargement of the papillæ beneath. In the fibrous, the central papillæ are much enlarged, and project ; each is surrounded by a sheath of epidermis ; and, consequently, while the circumference of the corn is laminated, the central portion presents a fibrous appearance. And, in ordinary language, these projecting papillæ are termed the "roots of the corn."

The indications of cure are simple. 1. To remove the cause ; by wearing suitable boots and shoes, or by leaving the part altogether unfettered for a time. 2. By careful dissection, to remove the hardened and hypertrophied cuticle ; and, by repetition, to prevent reproduction. 3. To remove the irritability, and to restore a normal state, of the cutis vera ; by occasional application of the nitrate of silver. 4. If inflammation have occurred, poulticing, fomentation, and rest are suitable. And the subsequently open state of the parts is taken advantage of, so that a free and effectual use of the nitrate may be made. 5. Inveterate cases are palliated, by wearing roomy and soft shoes and boots ; also protecting the corns, by means of thick plasters, which are excavated opposite the tender points. And into the excavations, it may be well to insert, occasionally, extract of belladonna, or some other anodyne substance.

Bunions are formed thus :—1. Inordinate pressure has been habitually made, by boot or shoe, on the ball of the great toe. The skin consequently becomes congested and tender ; and the part is red and swollen. This is one form of the affection. Remediable by abstraction of the cause, by rest and fomentation, and by a subsequent light use of the nitrate of silver, or of a solution of iodine. 2. Or an adventitious bursa forms over the joint ; and enlarges gradually. Occasionally, it may show an unusual size, by reason of bursitis. The remedies for this form are—abstraction of the cause ; discutient applications in the chronic stage ; antiphlogistics in the acute. A thin caoutchouc envelope is sometimes of service, by equalizing the pressure of the shoe. 3. Or, in consequence of repeated attacks of bursitis, the cyst suppurates, and opens externally ; the aperture becomes fistulous ; the cyst contracts,

but continues to discharge fluid, more or less ; and acute accessions are ever liable to occur. In this case, it is necessary to destroy the cyst, by inserting a piece of potass into the cavity. Afterwards, the granulating sore is brought to heal, under the ordinary means—rest, and simple applications. 4. There is an aggravated class of cases, in which there is enlargement of the osseous texture. Blistering and rest may make some favourable impression. By suitable wearing-apparel, palliation is obtained. 5. The joint may be partially displaced—in the rheumatic and gouty adult; the toe riding over its fellows, and pointing to the outer side of the foot. This, too, can be but palliated.

Onyxia and Onychia; Exostosis; and Contraction of the Toes.

Onyxia and Onychia require the same treatment, as when affecting the fingers. The great toe is the especial site of Onyxia. (Pp. 295, 296.)

Exostosis of the Distal Phalanx of the Great Toe, is a troublesome affection, not unfrequent in occurrence. Sometimes the growth takes place from the plantar aspect of the phalanx ; but much more frequently from the dorsal ; elevating the nail, causing pain, and seriously interfering with progression. Excision is performed, by means of a strong knife, or by cutting pliers ; and, should any reproduction threaten, during cure of the remaining wound, the chloride of zinc is applied. Should excision fail, amputation of the phalanx is to be had recourse to.

Contraction of the Toes.—The toes—more especially the one next the great toe—are liable to extreme contraction, whereby considerable deformity is produced, the wearing of boots and shoes is rendered painful, and the functions of the foot are interfered with. Subcutaneous section of the extensor tendon usually permits a sufficient restoration of the normal position. But it is not uncommon to find amputation of the offending toe expedient ; other means having proved unavailing, and the patient being himself anxious for a summary procedure.

CHAPTER XLII.

AMPUTATION.

MUTILATION by removal of a limb, or part of a limb, is the last resource of our art; and ought never to be had recourse to, until it is evident that other means either have proved, or must prove, unavailing. The profession have reason to rejoice that necessities for the performance of amputation are much less frequent than in former times; yet the circumstances are not few—and in all human probability never will be few—in which nothing but the sacrifice of a part of the body, will suffice for the retaining of existence. We are constrained to amputate; in spreading gangrene, as speedily as possible, if there be a sound space in which to make our incisions; in chronic gangrene, when the line of separation has been formed, and is advanced; in tumours which are of a malignant kind, and involve a bone or joint; in diseases of the joints, which have baffled our skill, and have caused an urgent hectic; in cases of recent injury, when it is evident that the parts are so far mutilated as to render recovery impossible; and in cases of attempted preservation of limbs, after injury, when it is plain that further continuance of the attempt must be attended with unwarrantable peril of life. Not unfrequently, also, a partially recovered limb proves so stiff, useless, and inconvenient, as to urge the possessor to seek for its removal; and such operations of "*complaisance*" are not always to be declined.

In the case of injury, amputation is either primary or secondary; the former, when done immediately, after the system has emerged from the state of shock, and before it has become involved in febrile excitement; the latter, when performed after the febrile accession has occurred, and when—it may be after some weeks—life is threatened by excessive suppuration, disease of bone, disease of joints, or sloughing of the soft parts. The comparative merits of primary and secondary amputations is still, with some, a disputed point. The question has already been considered, (*Principles*, p. 646,

and p. 686.) For its decision, a mere comparison of statistical details is obviously insufficient ; for, in one class are necessarily included all the most severe cases, while the other contains many of a very minor character. The two chief objections to the primary operations, are :—1. Two shocks may overpower a patient, who might have rallied successfully from one. To this it is answered, that the operator must choose his time skilfully ; not bringing the two shocks into immediate contact ; but waiting until the former has wholly passed away ; and not operating at all, unless a sufficient rally shall have taken place. It is seldom that a patient perishes of mere sinking, after amputation. 2. A robust state of body—in which the patient may be, at the time of the accident—is less favourable to recovery—it is said—than the comparatively reduced state which is to be found after subsidence of the inflammatory fever. This objection can obviously be removed, by a judicious antiphlogistic treatment of the case. Not unfrequently, inflammatory fever, and its results, afford no opportunity to judge of the expected favourable condition for secondary operation.

But we would rather refrain from the discussion in this place ; and would simply repeat the practical rule, on which the great majority of surgeons are agreed—That, when an injury has been sustained by a limb, of such a character as to render it impossible, in the opinion of the surgeon, that the part can be retained ; when, in other words, it is obvious that amputation must be performed at some period of the cure ;—it is better to amputate at once, so soon as the system has rallied from the primary shock ; preferring to encounter the minor risk by rapid succession of a second shock, rather than to meet the more perilous invasion of intense inflammatory action, with its serious consequences both to part and system.

Another question, scarcely yet arranged, is as to the comparative merits of the old circular method of operation, and of the modern operation by flaps. In this part of the country, the latter is tacitly preferred ; recourse to the circular method being quite the exception to the general rule of operating. And the obvious advantages are ; a more rapid performance ; a cleaner cut ; a better covering to the end of the bone ; and a power of selection, as to what parts shall consti-

tute the covering. The vessels are cut obliquely, no doubt ; but, if the ligatures be applied carefully—as they always ought to be—there is no risk of secondary bleeding on this account. (*Principles*, p. 505.)

In temporarily restraining hæmorrhage, during the incisions, the hands of an assistant are usually preferable to any tourniquet ; as has already been explained. (*Principles*, p. 499.) And pressure is not applied until the knife has begun to penetrate ; in order that no unnecessary loss of blood may be occasioned, by venous congestion beneath the site of compression.

In the Flap operation, the following are the more important points of detail. The patient is placed comfortably recumbent, on a firm table, of convenient height for the operator ; who places himself on the left of the patient, so that his right hand may be used, freely, for the incisions. The sound limb is held steady, and out of the way, by an assistant ; or is secured by a towel—in the case of the lower limbs—to a leg of the table. Ordinary assistants are ready to control the motions of the patient, to reassure him, and to minister to his wants—as to drink, movement of pillows, &c. A trustworthy assistant is ready to command the hæmorrhage, by the pressure of his own fingers, or by that of a tourniquet. Another is prepared to retract the flaps, and to tie the arteries. A third is stationed to hand what things may be required. And these are suitably arranged on an adjoining table ;—tourniquet, bandage, lint, ligatures, sutures, knives, saw, cutting-pliers, artery-forceps, sponges. If necessary, an assistant, seated in front of the patient, steadies and supports the limb to be removed.

Suppose that the thigh is to be amputated by double flaps. The surgeon grasps the flesh in front of the limb with his left hand, so as to raise it from the bone ; thereby facilitating the making of a full flap anteriorly. As the knife's point is about to enter, pressure is applied to the femoral. Transfixion is made, by pushing the knife down to the centre of the bone, horizontally ; gently passing the point round the bone to the front ; then pushing across, so as to make the point of exit as nearly as possible opposite to that of entrance. Moving the knife downwards and outwards, with a gentle sawing mo-

tion, a sufficient flap is formed anteriorly, and this is retracted by the assistant ; or, rather, is simply elevated. The knife's point is then re-entered, about an inch beneath the site of former transfixion ; in order to avoid cross-cutting of the integument, which is otherwise apt to occur. And, the second transfixion having been effected, a second flap is formed posteriorly. This is quickly laid hold of by the assistant's other hand ; and he now retracts both flaps ; pulling steadily ; and keeping his own fingers out of the way. The surgeon, by circular sweeps of his knife, divides the soft parts completely, as high as the fleshy commissure of the flaps will permit ; effecting this leisurely and coolly, in order that it may be done thoroughly. Not even a shred of periosteum should be left at the point which is to be sawn ; and this should be as close to the adherent cushion of muscle above, as the instrument can be made to go. The form of the wound—the flaps unretracted—is conical ; and the sawn end of the bone must occupy the very apex of the cone.

The assistant continuing to keep the flaps out of harm's way, the saw is applied to the isolated portion of bone—the side of the instrument lying close upon the fleshy wall above. The saw is held perpendicularly, and is “grooved” by drawing it lightly from heel to point. By steady sweeps, section is effected ; the surgeon, meanwhile, controlling the lower limb with his left hand ; making sure that it is not held too high, so as to lock the saw, by shutting it up in its own groove ; and taking equal care to prevent its being too much depressed, so as to favour splintering of the bone when the section is nearly completed. Should any roughness remain on the end of the bone ; either by splintering, or from natural construction ; this is to be removed by means of the cutting pliers.

Attention is now immediately directed to the arteries ; the largest being the first secured. Each is laid hold of with the artery-forceps, and, by being pulled outwards, is separated from all surrounding textures ; partly to insure deligation of the arterial coats only ; partly to secure application of the ligature beyond the oblique section of the vessel. By neglect of this, nerve and vein may be unnecessarily injured ; and the ligature's noose, traversing the oblique section, not going

beyond it, may leave a part of the arterial mouth still open, and ready to afford a troublesome hæmorrhage. So soon as the larger arteries have been secured, the assistant relaxes his pressure above, or altogether removes it. The smaller vessels can be quite commanded by the finger-points ; and, were the high pressure continued, venous loss of blood must necessarily ensue. Removal of the pressure, above, is usually sufficient to arrest the venous flow. But, should this continue, direct pressure is made ; either by the finger applied to the venous orifices, or by shutting the flaps and pressing them firmly together, for a short time. Deligation of a vein is unwarrantable. (*Principles*, p. 510.)

Bleeding having been satisfactorily arrested, the flaps are partially approximated by a few stitches ; and, a wet cloth having been applied to the line of wound, the patient is removed to bed. The subsequent treatment is conducted according to the principles formerly described—(*Principles*, p. 598) ; our object generally being to obtain adhesion ; yet, not unfrequently, preferring a moderate suppuration—as when the system has been long previously subjected to a copious discharge, the sudden arrest of which might seriously endanger the internal organs.

The *Circular amputation* is performed thus ; again supposing the thigh to be the part concerned. An assistant, grasping the limb with both his hands, draws up the skin as far as possible. The surgeon, holding the knife lightly, and with his arm at first placed under the thigh, divides the skin and cellular tissue in one continuous sweep. The assistant now retracts the skin, more decidedly than before ; and he is assisted in this, by the surgeon touching the subcutaneous tissues at various points with the knife. Close to the retracted integument, the knife is again laid on ; and, by a second sweep, the superficial muscles are divided. These are pulled upwards by a retractor—a portion of linen or leather, slit at one end ; and, by a third sweep of the knife, laid on close to the retractor, the bone is made bare. Retraction is then applied to all the fleshy textures ; touches of the knife assisting to expose the bone at a higher point ; and, this having been reached, complete isolation of the bone is effected there. The saw is applied, while by the retractor the muscles are pro-

tected from injury. Bleeding having been arrested, the soft parts are let down, and are arranged so as to make the line of wound rectilinear.

Amputation of the Fingers.

Amputation at the Distal and Middle joints is performed thus. An assistant controls bleeding, by grasping the wrist tightly. Another assistant separates the fingers from that which is doomed ; at the same time steadying the hand in a pronated position. The surgeon lays hold of the finger, slightly bending the joint at which removal is to take place ; and the articulation is then laid open, by a sweep of a narrow straight bistoury. Division of the lateral ligaments is completed, if need be, by the point of the instrument ; and the joint is more flexed, to favour disarticulation. This having been effected, the knife's blade is placed behind the head of the bone ; and, by cutting downwards and outwards, a sufficient flap is formed on the palmar aspect. Previously to disarticulation, the surgeon lays hold of the part on its dorsal and palmar aspects ; in making the flap, his hold is lateral. Or, the procedure may be reversed. The hand being placed in a state of supination, transfixion is made in front of the joint ; by cutting downwards and outwards, the flap is made in the first instance ; and then, by a sweep of the knife, disarticulation is effected, and the integuments on the dorsal aspect are divided. Usually, no hæmostatics are required. The flap is turned over the joint ; and is retained in its place, without suture, by bandage or by strap.

The Proximal phalanx, if not wholly involved by injury or disease, need not be entirely sacrificed. Amputation may be performed near the middle of the bone ; in obedience to the general rule, of saving as much as possible of the organ of prehension. A stump of the forefinger is especially useful. By transfixion, on the palmar aspect, a long flap is formed there ; and a small semilunar flap of integument is made on the dorsal aspect, by a subsequent sweep of the knife. Or, corresponding flaps may be made on the sides of the finger ; in cases of external injury, when the palmar aspect is much mutilated. The bone, having been made bare at the upper

part of the wound, is severed by cutting-pliers. Hæmorrhage having been arrested, the flaps are united and retained in the ordinary way.

Amputation at the Metacarpal Joint may be performed in one of two ways. The hand is held pronated. 1. The finger, well separated from its fellows, is laid hold of by the surgeon, and pushed to one side. On the exposed and tense web, the bistoury is passed upwards, from point to heel, so as to expose that side of the articulation; at the same time, leaving on its outer side a flap of suitable dimensions. With the knife's point, disarticulation is effected; the finger being pushed much across to facilitate the process. Were the blade to be used for this purpose, ragged wounding of the integument could not well be avoided. The head of the bone having been detached, the blade of the knife is placed behind it; and, by cutting obliquely outwards, a second flap is formed, to suit the former—while, at the same time, detachment of the finger is completed. 2. Or, the knife's point is entered on the centre of the knuckle; and, by one continuous movement, is carried round the finger, so as to make two equal, lateral, semilunar flaps, at the same time exposing the joint. Disarticulation is then completed, and the part removed. The digital arteries usually require ligature. Approximation is effected by bringing the two adjoining fingers together, and retaining them so by means of a slip of bandage. Cold pledgets of lint are applied; and, otherwise, the wound is managed in the ordinary way. (*Principles*, p. 598, et seq.)

When operating on the fore and little fingers, it is well to extend the incisions a little upwards, to expose the head of the metacarpal bone, and to remove its articulating surface by means of the cutting-pliers. The stump is more rounded, and has a more seemly appearance after cicatrization, than when the end of the metacarpal bone is left projecting. But, in doing this, care must be taken not to injure the transverse ligament.

Amputation of the Metacarpal Bones of the fingers is sometimes required; in consequence of disease affecting one or more of them. The incisions vary, necessarily, according to the extent of the disease, and the site of the openings already existing. Disarticulation from the carpus requires both skill

and caution. The fingers are taken with the metacarpal bones ; for, the former become useless appendages, when deprived of their support. Lately, in amputating the middle finger and its metacarpal bone, I found the corresponding carpal surface in a carious state. By the use of a gouge, the diseased parts were removed ; and the recovery proved most satisfactory.

Disease or injury of three metacarpal bones, does not warrant removal of the whole hand. The stump which results from amputation of the affected parts only, is infinitely more serviceable than that which follows complete mutilation.

When the lower part, only, of a metacarpal bone is affected, disarticulation at the carpus is not attempted ; but section of the bone is made in its shaft, by means of the cutting pliers. The knife is entered on the dorsal aspect, at the point where section is to be made, and is carried down in the mesial line, till the knuckle is reached ; there a divergence is made, on either side, as in amputation of the finger only ; but without passing the knife so deeply as to open the articulation. Then, by dissection, the diseased portion of the bone is isolated ; care being taken to leave the palm entire.

Also, when a single metacarpal bone is removed entire, it is well to spare the palm ; the hand being afterwards both more useful and more seemly than it otherwise would be.

Amputation of the Metacarpal bone of the Little Finger is effected thus. The finger is laid hold of, and separated from the others ; and the bistoury, laid on the stretched web, is carried up at once, along the inside of the metacarpal bone, to its articulation with the unciform bone of the carpus. The doomed part being much pushed outwards, disarticulation is effected, with the point of the knife. And then, the blade having been placed behind the base of the bone, a suitable flap is formed on the outer side, by bringing the knife downwards and outwards—causing it to emerge a little below the metacarpal articulation. Hæmorrhage having been arrested, the flap is accurately adjusted to the raw metacarpal surface, and is retained in the usual way.

Or, the flap may be made in the first instance ; by transfixing at the carpal articulation, and carrying the knife downwards and outwards, as before ; or, by marking out the

flap with the knife's point, and dissecting it up—cutting from without inwards. One obvious advantage of this mode of operating is—that should the base of the metacarpal bone be found not diseased, it may be saved ; instead of disarticulation, the bone is cut across by the pliers.

Amputation of the Thumb.

The phalanges of the thumb are removed in the same way as the phalanges of the fingers.

Amputation of the Phalanges, with the Metacarpal Bone, may be effected in the same way as removal of the little finger and its metacarpal bone ; by placing the bistoury on the web between the thumb and forefinger, passing it up to the articulation with the trapezium, disarticulating there, and forming a suitable flap by bringing the knife down on the opposite side of the bone. Or, by transfixing at the articulation with the trapezium, and making the flap in the first instance ; afterwards effecting disarticulation, isolating the bone, and removing the member. Or, the flap may be made by dissection upwards. Or, the bistoury may be entered over the trapezium, and carried down on the dorsum of the metacarpal bone ; having reached the distal extremity of this bone, it may be swerved to the inside ; thence it may be made to transfix the ball of the thumb, emerging where it first entered ; and, by cutting outwards and downwards, the flap may be constructed.

Amputation of the Wrist.

Hitherto, pressure on the wrist has sufficed temporarily to restrain hæmorrhage. Now, compression of the humeral is expedient ; and is best effected, by the firm and steady grasp of an assistant—on the lower part of the arm—the nerves being excluded from pressure as much as possible.

Hitherto, also, a narrow, straight, sharp-pointed bistoury has been the preferable instrument, for making the incisions. Now, a regular amputating knife is required. An exaggeration of the former instrument, in a fixed wooden handle ; straight, sharp-pointed, and of fine edge and temper ; light

yet firm. The amputating case contains various sizes ; proportioned to the dimensions of the parts which may require their use.

For the wrist, the shortest size will suffice ; the blade not much larger than that of a full-sized bistoury. The arm is steadied, with the hand in a state of pronation. The knife is laid on below the styloid process furthest from the operator—who stands on the patient's left—and is carried across the limb so as to form a semilunar wound on the dorsal aspect, whose centre extends as far as the second carpal range, and whose termination is below the styloid process on the side next the surgeon. An assistant retracts the flap thus formed. The wrist is bent, and disarticulation effected. The blade of the knife is then laid behind the first carpal range ; and, by cutting outwards and downwards, a suitable flap is formed on the palmar aspect. In the last part of the proceeding, the pisiform bone is to be avoided ; and, in endeavouring to escape from it, care must be taken not to notch the corresponding portion of integument. The radial, ulnar, and interosseous arteries, require ligature.

Amputation of the Forearm.

Pressure being made on the humeral, the limb is steadied, with the hand in a state of pronation. Two flaps are formed ; one on the dorsal, the other on the palmar aspect. Below the middle of the forearm, it is not easy to obtain a sufficiency of fleshy covering. Yet—when circumstances will at all permit—the general rule is not to be rashly deviated from ; of removing as little as possible from the organs of prehension. And, besides, another practical axiom comes into play ; namely, that the further removed an amputation is from the trunk of the body, the less is the risk to life thereby.

The flaps may be made either by transfixion, or by cutting from without inwards. The former mode is usually preferred. In the case of the left forearm, the surgeon with his left hand pinches up the cushion of flesh on the dorsal aspect, and enters the knife horizontally over the ulna, bringing it out at a corresponding point over the radius. The knife is again introduced, beneath the ulna, and pushed through on the palmar

aspect of the bones ; not at the same point as the former transfixion, but about half an inch lower down—a precaution which is to be attended to in all double-flap amputations, as already stated. An assistant retracts the flaps ; with a few circular sweeps of the knife, the surgeon clears the bone of soft parts, at the very upper part of the wound ; the interosseous space is freed, by the knife being passed between the bones ; and the saw is then applied. At least, the three principal vessels require ligature. The wound is then adjusted in the ordinary way.

In transfixion, it is obvious that care must be taken to avoid passing the knife between the bones. And, on this account, the position of the limb here recommended is preferable to the middle state between pronation and supination.

Amputation of the Elbow-joint.

If space enough be left on the forearm, in extensive disease or injury of that part, the humerus need not be interfered with. An excellent operation may be done at the elbow ; making a single flap in front. The limb is steadied, with the hand in a state of supination. Transfixion is made, by passing the knife over the condyles, in front of the joint ; and, by cutting downwards and outwards, a large and suitable flap is constructed. With a circular sweep, the integuments behind are divided ; and disarticulation is then effected. The olecranon may be sawn across ; or, extending the forearm, this process may be wholly removed, the attachment of the triceps having been severed.

Amputation of the Arm.

Pressure is made on the upper part of the humeral, or in the axilla. The surgeon, with his left hand, steadies the limb, below the point of incision ; an assistant, seated in front of the patient, supports the hand and forearm. The knife is entered, horizontally, over the bone, near its centre, on the side of the limb nearest the surgeon ; the point, having touched the bone, is passed lightly round to its anterior surface, by depression of the handle ; then the handle is raised again to its former

level, and transfixion is completed. By cutting downwards and outwards, an anterior flap is formed. The knife is re-entered on the opposite aspect of the bone, a little lower down; and, after transfixion, is brought out so as to construct a corresponding flap posteriorly. The flaps having been retracted, the bone is bared, and the saw applied.

Amputation of the Shoulder-joint.

Hæmorrhage is restrained by pressure applied to the subclavian, above the clavicle; by the fingers alone; or by means of the handle of a key, well padded; or by means of any other suitable compressing agent. The pressure is not made downwards; but downwards and backwards, so as to jam the vessel between the compressing agent and the first rib. The patient may be either seated or recumbent. The former position is the more convenient for the operator, as well as for the compressor; but it is necessary to secure the patient against changing his position, through fainting or restlessness, by lashing him to the back of the chair by means of a sheet or towel, as well as by a suitable arrangement of supporting assistants. In cases of injury, the selection of flaps, as to position and form, may not be left to the surgeon's choice; but may have been already indicated by the nature of the accident. When space and opportunity for selection are afforded, the operation may be accomplished in a variety of ways. But the method by transfixion, and by the formation of an outer and inner flap, is so generally preferred and practised, that to it alone need attention be directed. The steps of the operation vary according to the limb operated on. In the *right* shoulder, it is effected thus. A long knife is entered on the top of the shoulder, about an inch below the acromion; and, passing round the joint, on its exterior, is brought out immediately within the posterior border of the axilla. By cutting outwards and downwards, a large outer flap is formed. The arm is then carried across the chest; and the head of the bone, thus made prominent, is cut down upon by a sweep of the knife. The capsule is opened, and disarticulation effected; and the blade of the knife, laid on the inside of the head of the bone, is carried rapidly inwards and down-

wards, so as to form an internal flap, considerably smaller than the other. The main artery is immediately secured by ligature; and then pressure on the subclavian is removed, lest, by its continuance, venous hæmorrhage should be favoured.

On the *left* side, the knife, having been entered within the margin of the posterior border of the axilla, is made to emerge on the top of the shoulder, a little beneath the acromion; and the outer flap is formed as before. The arm is then carried over the chest, disarticulation is effected, and an inner flap is formed. Or, the outer flap may be marked out by a bistoury, and dissected up.

After cicatrization, the stump requires artificial protection; otherwise, the prominent acromion is apt to sustain injury.

Amputation of the Scapula.

Disease and injury sometimes, though rarely, render it necessary to take away the scapula along with the superior extremity. No fixed plan can be laid down for the incisions; they must vary according to the circumstances of the case. When such extensive mutilation is required on account of injury, the greater part of the incisions will probably be found already made.

AMPUTATIONS OF THE LOWER EXTREMITY.

Amputation of the Toes.

The *Phalanges* of the toes are removed in the same way as those of the fingers. The metatarsal articulation, however, lies considerably deeper than the corresponding joint of the superior extremity; and the incisions require to be made accordingly. There is no necessity for removing the head of the metatarsal bone; the more ample the base of support, the more efficient is its function.

The *Metatarsal Bone of the Great Toe* is not unfrequently diseased in the greater part of its extent. It may be disar-

ticulated; but it is better to divide it a little below its base, if possible, in order to leave the muscular insertion there undisturbed. By a bistoury, such a flap is indicated as will efficiently cover the wound. The instrument is entered over the tarsal articulation, on the dorsum of the bone, and is carried down, along the dorsum, until the metatarsal joint is reached; a sweep is then made on the inner side of this—or rather a little below the joint; and the incision is continued upwards, leaving an interspace of about an inch and a half between the returning line of wound and that which descended. The flap, thus indicated, is dissected up; the bone, along with the corresponding toe, is isolated from its connexions, by a suitable use of the knife's point; and is either disarticulated, or cut across by the pliers, according to circumstances. After removal of the diseased part, and arrest of hæmorrhage, the flap is brought down and adjusted to the raw surface.

The other Metatarsal Bones are liable to the same operations, as the analogous bones of the superior extremity. A very useful foot may be left, after removal of the third and second toes, with their metatarsal bones.

Amputations of the Foot.

All the Toes may require removal at their metatarsal articulations, on account of frost-bite. A transverse incision is made on the dorsal aspect; sloping inwards, so as to make a short anterior flap. Disarticulation is then effected, at each joint; and, the blade of the knife having been laid behind the heads of the phalanges, a suitable flap is made from the plantar aspect.

Should the extent of disease not admit of such a procedure, similar flaps may be formed—the plantar being made by transfixion; and then the metatarsal bones are divided by the bone-pliers.

Hey's Amputation.—The whole metatarsal range may be taken away, leaving the foot very useful. Hæmorrhage is restrained by the pressure of an assistant at the ankle—mainly exerted on the posterior tibial. The patient is laid recumbent on a table, with the foot projecting over the edge.

The surgeon, with his left hand, steadies and commands the toes. On the right foot, the prominence of the base of the metatarsal bone of the little toe is felt for; the knife's edge, laid on immediately above this, is carried across the dorsum of the foot in a semilunar direction, terminating at the articulation of the base of the metatarsal bone of the great toe with the internal cuneiform bone. The short anterior flap, thus indicated, is dissected up; and disarticulation is effected at each joint; the surgeon pressing heavily downwards on the toes and metatarsal range, so as to favour this, by rendering the joints more open. The peculiarity of the relative position of the base of the second metatarsal bone, has to be borne in mind; and the point of the knife, only, should be used for its detachment. Should ankylosis have taken place there, the pliers are to be employed; dividing the bone on a line with the general range of articulation. Disarticulation having been effected, the blade of the knife is laid on behind, and a sufficient flap is made from the sole of the foot—longer on the inner than on the outer aspect. The bleeding vessels having been secured, the flap is turned up, and is retained by suture and strap. In operating on the left foot, the dorsal incision is begun over the articulation of the metatarsal bone of the great toe with the internal cuneiform bone, and terminates behind the prominent head of the metatarsal bone of the little toe; in other respects, the operation is the same.

Chopart's Operation.—Amputation may be performed still higher, leaving a useful stump. Disarticulation is effected between the astragalus and the navicular bone; all the bones of the foot and tarsus being removed, except the astragalus and calcaneum. The operation is conducted on the same principles as the preceding; a short flap being made in front; and the main flap being obtained from the sole of the foot, after disarticulation. The marks for laying on the knife in its dorsal sweep, are, the articulation of the navicular bone with the astragalus—behind the prominence of the navicular bone, in front of the inner ankle; and the articulation of the cuboid with the os calcis—about midway between the outer ankle, and the prominent base of the metatarsal bone of the little toe. Often, however, these marks cannot be discerned,

on account of swelling. After cicatrization, the remnant of the foot is not found to be displaced backwards, so as to bring the cicatrix in contact with the ground in walking, as might have been expected, from preponderating action of the muscles of the calf. The muscles on the front of the leg, forming new attachments, seem to counteract this effectually.

A third amputation of the foot—intermediate between the two preceding—may be performed, by disarticulating the cuneiform bones from the navicular, and sawing the cuboid bone across at a corresponding point. The general plan of the incisions is the same as in the two preceding cases.

Amputation of the Ankle.

When no part of the foot and tarsus can be saved, amputation is required either in the leg or at the ankle. The latter site is preferable on more than one account; risk to life is less; the mutilation is less; and the stump is not only more useful in progression, but also less liable to neuralgia and exfoliation. Disease of the ankle-joint does not contra-indicate the operation, unless it extend beyond the ends of the bones. And, in most cases of diseased ankle, indeed, it were now unwarrantable to perform any other operation.

For the revival and more general introduction of this procedure, the profession is indebted to Mr. Syme.

The patient having been suitably arranged on a table, a tourniquet is applied, so as to compress the popliteal artery; for, as the operation is necessarily tedious, the fingers of an assistant may become fatigued ere its completion. A strong bistoury is preferable to the amputating knife. A semilunar incision, directed forwards, is made over the instep; and a corresponding wound is made across the sole of the foot. "A line drawn round the foot, midway between the head of the fifth metatarsal bone and the malleolus externus, will show their extent anteriorly, and they should meet a little way farther back, opposite the malleolar projections of the tibia and fibula." The flaps, thus indicated, are dissected off; the upper in the first instance; cutting into the joint, and turning out the calcaneum. This latter part of the operation is

both tedious and difficult ; and great care is necessary to avoid perforation of the integument.* If the bones of the leg are sound, ablation of the malleolar projections, by means of cutting-pliers, is sufficient, after removal of the foot. But, when the bones are diseased, the implicated portions are removed by the saw. Bleeding having been arrested, the flaps are brought together by suture ; and care must be taken, during the cure, to prevent accumulation of pus in the pouch which may be formed by the posterior flap. A counter-opening, through the skin of what was the heel, may, on this account, become necessary. After cicatrization, a most efficient, round, callous stump is produced ; the patient resting on the integuments of the heel—well accustomed to pressure—and retaining a full use of the knee and leg.

It has been said that division of the posterior tibial artery, before it divides into its plantar branches, should be avoided ; otherwise, partial sloughing of the flaps is apt to ensue. Usually, incision will not be found to interfere with the arterial trunk in question. And it is probable that in those cases in which sloughing has occurred, the accident was not wholly attributable to deficiency of arterial supply.†

Should circumstances not be suitable to the formation of flaps, as above described, lateral flaps may be made—leaving the integument of the heel as much entire as possible. The operation will be more readily effected in this way ; but there is risk of a less convenient cicatrix resulting, and consequently of the stump proving less useful in progression.

Amputation of the Leg.

This is not altogether superseded by the operation at the ankle. There are still not a few cases occurring, in which the latter procedure would prove quite insufficient. And in regard to some of these it is to be feared, that the natural preference for a new operation may lead to its perform-

* This part of the operation might, perhaps, be facilitated by previous division of the tendo Achillis, by subcutaneous puncture.

† Lately, severe sloughing happened in a case under my care in the Hospital ; but this was plainly the result of grave erysipelas—occurring at an unhealthy season. Notwithstanding extensive loss of substance, the ends of the bones are likely to be sufficiently covered with integument.

ance in circumstances quite unsuitable. The affected parts of the leg-bones having not been sufficiently removed, sinuses and fistulæ may form, communicating with caries; long retarding complete cure; rendering the stump but little serviceable, perhaps, even when healed; and, probably, at length, demanding a second amputation.

Near the ankle, a fleshy stump is not to be obtained in thin persons; and in these, consequently, we may be compelled to cut somewhat higher than otherwise might have been necessary. On the other hand, there are stout limbs—their rotundity mainly caused by a solid œdema—in which it is desirable to amputate low down, in order to avoid a redundancy of soft parts.

Hæmorrhage is restrained by pressure on the popliteal, either by a tourniquet, or by the fingers of an assistant; or by the assistant's pressure on the femoral artery, as it passes over the brim of the pelvis. The patient is laid on a firm table, of convenient height, with the limbs projecting over its edge; the sound ankle is secured to the leg of the table by means of a towel—the work of an additional assistant being thus spared; and the doomed limb is supported by an assistant seated in front. The surgeon, feeling the exact outline of the bones, transfixes; passing his knife as closely as possible to their posterior surface; and, by carrying it downwards and outwards, a long posterior flap is formed. The knife is then laid on at the upper margin of the wound; by a sweep in front, in a similunar direction, the integument is divided; this having been retracted, the interosseous space is cleared by the knife passed between the bones; and the saw is then applied as close to the soft parts as possible. If the ridge of the tibia project, much and sharply, it may be rounded off by means of the bone-pliers. Bleeding having been arrested, the flap is brought up and secured.

To facilitate transfixion, and guard against locking of the knife between the bones, it may be well to make a little alteration in the procedure. Supposing that the right leg is operated on, the knife is entered on the outside of the fibula, about an inch, or more, beneath the point where transfixion is contemplated; with a sawing motion the instrument is carried upwards along the outside of the bone, until the site

of transfixion is reached ; the blade is then applied in front, to form the anterior wound ; and, the point having arrived at the inside of the tibia, transfixion is effected—the instrument emerging at the upper part of the wound formerly made on the outside of the fibula.

In operating immediately below the knee, the fibula is sawn across, along with the tibia. Disarticulation of the head of the former bone may improve the appearance of the stump, at the time of its formation ; but experience has shown that the procedure is not warrantable, on account of the risk of subsequent inflammatory seizure in the knee-joint.

A short stump having been made, the patient rests on the knee, with the stump bent at right angles ; and to the knee the artificial limb is adapted. When the stump is long, the motions of the knee-joint are retained, and the false limb is adapted to the leg immediately above the cicatrix.

When stout, muscular men sustain such injury of the leg as requires amputation below the knee, a redundancy of flesh cannot fail to be obtained in the flap, by the ordinary mode of operation. And, accordingly, Mr. Liston has advised, in such cases, a modification of the circular amputation. “Supposing the left leg to be injured :—with a common amputating knife an anterior semilunar incision is made through the skin, commencing from the inner side of the tibia, about four fingers’ breadth below its superior extremity, and passing over its anterior aspect. A similar semilunar incision is made at the posterior part of the leg, its extremities joining the horns of the previous incision. The integument is then reflected upwards to a sufficient extent to cover the bones, and the operation is finished after the manner of the circular amputation.”

Amputation of the Knee-Joint.

Latterly, this operation has also been revived by Mr. Syme ; when injury or disease extend no higher than the condyles of the femur, and involve these only to a superficial extent. A semilunar incision is made on the front of the limb, passing beneath the patella ; the integuments are dis-

sected up, and transfixion is made behind; by cutting downwards, a very long flap is made from the back part of the leg; and, the soft parts having been all detached, section of the bone is made through the condyles. Bleeding having been arrested, the flaps are approximated.

Amputation of the Thigh.

The patient is arranged as for amputation below the knee, but with the pelvis resting on the edge of the table. The femoral is compressed by an assistant, as it passes over the horizontal ramus of the pubes. The operation is by double flaps. Low down in the thigh, a suitable amount and character of soft parts can be obtained only from the lateral aspects of the limb. Transfixion, accordingly, is made perpendicularly.

On the upper part of the thigh, the flaps are anterior and posterior; transfixion is horizontal; and the operation is performed in the same way as the analogous procedure in the arm, (p. 659.) The posterior flap should be considerably longer than that in front; to compensate for the greater displacement upwards, by contraction, to which the muscles on the posterior part of the thigh are liable. Immediately after section by the saw, the muscles inserted into the trochanter-minor project the end of the bone forwards; and, in consequence of this, protrusion at the upper angle of the wound would be apt to take place, were the flaps here made laterally; while, as it is, the more the bone is bent forwards, the more completely is its extremity covered by the anterior flap.

Mr. Syme has recently expressed an opinion, that risk to life, arising from amputation in the thigh, depends mainly upon the bone being sawn near its centre; where the bone is dense externally, and where the medullary cavity is exposed. The medullary cavity is liable to become inflamed; and diffuse suppuration may take place, with perhaps more or less phlebitis. Tendency to exfoliation, too, is comparatively greater. To avoid such casualties, he proposes always to amputate in cancellous tissue; sawing the condyles, by amputation at the knee, in preference to amputation in the

lower part of the shaft of the bone ; and operating as high as the trochanters, in preference to amputation in the middle of the bone. Further experience is required to decide this matter. But, it is probable, that it will not be found expedient to contravene the general axiom—"the nearer the trunk the nearer to life ;" and that we are not warranted in amputating high in the thigh, when a lower operation might suffice. When the saw is applied to the centre of the bone, the risks, formerly noticed, may surely be in a great measure avoided—by a careful use of the instrument ; by careful, light and gentle dressing of the stump ; and by judicious general treatment.

Amputation of the Hip-Joint.

It is seldom that removal of the limb at the hip-joint is required. The operation is one of great severity, and eminently perilous to life ; yet, when circumstances are clamant and decided, we need not shrink from its performance. There are already about twenty successful cases in the records of surgery. For malignant disease of the femur, the operation is unadvisable ; for, experience has shown, that, even although the operation itself may be temporarily successful, return of disease in the interior will surely carry off the patient—probably at an earlier period, and more painfully, than if the tumour had been left undisturbed in its original site.

The patient is placed on the table, with his pelvis projecting from the edge. A steady assistant compresses the femoral ; and is ready to follow the knife with his fingers, during formation of the anterior flap, so that he may grasp the end of the vessel almost as soon as it is divided. The knife is entered about midway between the trochanter major and the anterior superior spinous process of the ilium, and is made to emerge on the inside of the thigh, after having passed in a somewhat curved direction over the articulation ; the assistant, who supports the limb, gently rotating the thigh inwards. By cutting downwards, a suitable anterior flap is formed. The assistant, then abducting the thigh, presses it backwards ; and by a determined sweep of the knife, over the head of the bone thus made prominent, the joint is cut into.

With the point of the instrument, the round ligament is divided, and disarticulation effected. The blade of the knife is then placed behind the bone, and is carried downwards and backwards, so as to form the posterior flap; the assistant managing the limb so as to prevent locking of the instrument by the trochanter major. The posterior flap is instantly covered by a sponge; and the vessels there are rapidly secured. Afterwards, the assistant is relieved from his charge of the femoral.

By some, the formation of lateral flaps is preferred. Not unfrequently, in cases of injury, there may be no room for selection; the extent of the accidental wound precluding all attempts at regular operation, and compelling the surgeon to shape his flaps according to what may be, perhaps, quite an original mode of procedure.

Affections of Stumps.

Neuralgia of the stump is no unfrequent result of amputation, however skilfully conducted, (*Principles*, p. 524 and 579.) It is most commonly observed after amputation below the knee. If no change of structure in the nerve can be detected, the treatment must be such as is suitable for neuralgia in general; and, of the remedies usually found most useful, iron internally, and the light application of nitrate of silver to the part, may be specially mentioned. If neuromata plainly exist, entangled with the dense cicatrix, they ought to be removed; and, for this purpose, a repetition of the amputation on a minor scale is usually necessary; care being taken, in the fashioning of the stump, and in the after-treatment of it, that the nerves may not be again similarly circumstanced. Not unfrequently, however, notwithstanding every care, neuralgia returns—obviously dependent on a general more than on a local cause, (*Principles*, p. 580.) The neuralgic part should not be pressed upon, in the adaptation of any artificial limb.

Exfoliation from the stump seldom follows a well-conducted flap-operation. It is most likely to occur, when section has

been made in the dense part of a bone. The sequestrum may consist of a mere scale from the extremity of the bone ; or it may be of some length—involving the whole thickness of the bone at its lower part, and tapering, upwards, of a cancellous texture. The healing of the wound is necessarily delayed, until detachment and extrusion of the sequestrum have taken place.

Sometimes, in an ill-formed stump, or when the soft parts have perished by sloughing, the end of the bone projects, uncovered, partially necrosed, and in part, perhaps, carious. In such a case, renewal of the amputation is necessary ; or, the making of such incisions as may admit of the bone being sawn, at a point sufficiently high for subsequent fleshy covering.

The accidents of exfoliation, and protrusion of the end of the bone, ought to be prevented ; by fashioning the flap, or flaps, so as to afford a full covering for the end of the bone ; by sawing the bone, carefully, close to its connexion with the soft parts—not leaving any portion bare and projecting, stripped of both flesh and periosteum, at the time of the operation ; by so conducting the cure as to prevent untoward accessions of inflammatory action, whereby ulceration, sloughing, or long gaping of the wound might occur ; by preventing excessive retraction of the muscles, if need be, by bandaging—in those cases in which the process of granulation is interrupted or tedious. The face of a well-formed stump is “fenced with firm skin, and no more liable to accident than a man’s finger-ends.”

A *Bursa* usually forms over the end of the bone ; tending towards tolerance of pressure. A blow, or other injury, may induce painful enlargement of this ; and the fluctuation, and other characters of the swelling, may simulate the condition of acute abscess very closely. Accuracy of diagnosis is obviously of importance ; as, in the one case, early incision is advisable ; while, in the other, rest and fomentation, with perhaps leeching, prove sufficient.

Hæmorrhage.—Bleeding, taking place within a few hours after the operation—when the patient grows warm in bed, and recovers fully from the state of shock—usually requires an undoing of the partial approximation of the wound, and

the application of ligatures to the open vessels. But, if at the time of operation, due care have been taken to apply deligation accurately to each likely orifice, the occurrence of such a casualty need seldom be apprehended.

Hæmorrhage which occurs at a more remote period, in consequence of ulceration having attacked the stump, may, if slight, be restrained by pressure. But, in general, deligation of the arterial trunk is necessary ; for example, deligation of the femoral, after amputation below the knee ; deligation of the humeral, after amputation of the fore-arm, (*Principles*, p. 507.)

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